CLINICAL GUIDELINES
Diagnosis and treatment manual

For curative programmes in hospitals and dispensaries, guidance for prescribing

2016 edition

MEDECINS SANS FRONTIERES

Clinical guidelines

Diagnosis and treatment manual

For curative programmes in hospitals and dispensaries

Guidance for prescribing

2016 edition

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Foreword

This diagnostic and treatment manual is designed for use by medical professionals involved in curative care at the dispensary and hospital levels.

We have tried to respond in the simplest and most practical way possible to the questions and problems faced by field medical staff, using the accumulated field experience of Médecins Sans Frontières, the recommendations of reference organizations such as the World Health Organization (WHO) and specialized works in each field.

This edition touches on the curative and, to a lesser extent, the preventive aspects of the main diseases encountered in the field. The list is incomplete, but covers the essential needs.

This manual is used not only in programmes supported by Médecins Sans Frontières, but also in other programmes and in other contexts. It is notably an integral part of the WHO Emergency Health Kit.

Médecins Sans Frontières has also issued French and Spanish editions. Editions in other languages have also been produced in the field.

This manual is a collaborative effort of medical professionals from many disciplines, all with field experience.

Despite all efforts, it is possible that certain errors may have been overlooked in this manual. Please inform the authors of any errors detected. It is important to remember, that if in doubt, it is the responsibility of the prescribing medical professional to ensure that the doses indicated in this manual conform to the manufacturer 's specifications.

The authors would be grateful for any comments or criticisms to ensure that this manual continues to evolve and remains adapted to the reality of the field.

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This manual is also available on the internet at www.refbooks.msf.org. As treatment protocols for certain diseases are constantly changing, medical staff are encouraged to check this website for updates of this edition.

How to use this manual

Organization

There are two easy ways to find information in this manual:
– The *table of contents* at the beginning of the manual with the number and title of each chapter, their subsections and page numbers;
– An *alphabetical index* at the end of the manual with the names of the diseases and symptoms.

Names of drugs

The International Non-proprietary Name (INN) of drugs is used in this manual. A list of current proprietary names can be found at the end of the manual.

Abbreviations used

Units

kg	=	kilogram
g	=	gram
mg	=	milligram
µg	=	microgram
UI	=	international unit
M	=	million
mmol	=	millimole
ml	=	millilitre
dl	=	decilitre

Administration route

PO	=	per os – oral
IM	=	intramuscular
IO	=	intraosseous
IV	=	intravenous
SC	=	subcutaneous

For certain drugs

NSAID = nonsteroidal anti-inflammatory drug

SMX + TMP = sulfamethoxazole + trimethoprim = cotrimoxazole

Expression of doses

– Doses of the combination sulfamethoxazole + trimethoprim (cotrimoxazole) are expressed as SMX + TMP, for example:
  Children: 30 mg SMX + 6 mg TMP/kg/day
  Adults: 1600 mg SMX + 320 mg TMP/day
– Doses of the combination amoxicillin + clavulanic acid (co-amoxiclav) are expressed in amoxicillin.
– Doses of certain antimalarial drugs are expressed in base (and not in salts).
– Doses of iron are expressed in elemental iron (and not in ferrous salts).

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Introduction

These *Clinical guidelines* should be viewed as an aid in prescribing treatment. They do not go into detail on public health measures like immunisation and nutrition programmes, or hygiene and sanitation procedures, for managing the health of a population; these are covered in other publications. They do, however, talk about preventive measures – such as vaccines – that patients can be offered to protect them from disease.

Objective

These guidelines' primary objective is to cure an individual patient of his disease, and to minimise the impact of that disease on both the patient and those around him (the risk of transmission, for example).

But well-organised, carefully-followed treatments for high priority pathologies – such as infectious diseases – also reduce mortality in the population. And if enough patients are treated for endemic diseases like tuberculosis, transmission will be reduced.

Strategy

Curative activities should focus on priority targets, in terms of both diseases and particularly vulnerable populations. All prescribers should be familiar with the epidemiological situation around the medical facilities in which they practice (epidemic and endemic diseases, the frequency of traumatic injuries, etc.), and with the demographics of the population they serve (proportion of children under five and pregnant women, as they are more vulnerable).

The treatment protocols and drugs that are used must be adapted to the epidemiological circumstances; that is the aim of both this publication and *Essential drugs - practical guidelines*. These two sets of guidelines use a narrow list of drugs based on the World Health Organization's (WHO) model list of essential medicines. Health ministries may, however, have their own national list of essential drugs and treatment protocols that must be followed.

Resources

The quality of prescribing relies on prescribers (health workers, physician's assistants, nurses, midwives and physicians) being properly trained. It will vary depending on the region and on the level of both their training and the medical facility in which they work (health post, health centre or hospital). As that level must often be evaluated to ensure that training is adequate, this publication and the *Essential drugs* factsheets can be used as a foundation.

The drugs are chosen based on:

– Their efficacy and tolerance (few adverse effects);
– Their ease of administration, duration of action, number of daily doses and ease of adherence;
– Their stability at room temperature, availability, and cost.

The WHO model list of essential medicines is the basic tool for this selection, which should be fine-tuned to the epidemiological profile of the region, the skills of the medical staff and the possibility of referral to a higher-level medical facility.

The most important basic rule for a prescribing programme is standardised treatment protocols. These is essential to the overall effectiveness of the treatments offered, health care staff training and programme continuity during staff turnover.

The protocols in these guidelines were written according to the following principles:

– All drugs are designated by their international non-proprietary name (INN).
– Selection is based on clinical and epidemiological reasoning, and on scientific evidence that can be discussed and agreed upon by users.
– Selection facilitates treatment adherence: the shortest possible treatment with the fewest daily doses; single dose treatments always given preference; the fewest possible drugs prescribed. When efficacy is comparable, the oral route is preferred to reduce the risk of contamination by injectables.

Consultation

Try to provide enough prescribers for the expected number of patients, so that each patient gets at least 20 to 30 minutes per consultation.

The consultation area for diagnosis and treatment should be carefully arranged to ensure privacy during the interview and patient comfort.

The quality and outcome of the treatment depends on more than just the protocol. Treatment adherence relies on the quality of the trust relationship established by the prescriber and the respect he shows the patient.

The prescriber must know the local habits – for example, whether it is customary to have gender-separate consultations, or if there is a rule that the examination must be done by a prescriber of the same gender as the patient.

It is often necessary to use an interpreter, and interpreters should be trained in systematically questioning the patient regarding his complaints and history. Like the rest of the health care staff, interpreters must be aware that they are also bound by the rules of confidentiality.

Diagnosis rests primarily – and sometimes exclusively – on the clinical findings; hence the importance of taking a careful history of the complaint and symptoms and doing a complete, systematic exam. The data should be copied into the health record, admission note or register so that the patient's progress can be monitored.

Diagnostic aids

The equipment for ancillary testing depends on the level of the facility where the treatment takes place.

When there is no laboratory available, either for outpatient or inpatient care, rapid diagnostic tests may be made available (for malaria, HIV, hepatitis B and C, etc.).
A laboratory must be set up for certain diseases, such as tuberculosis, trypanosomiasis and visceral leishmaniasis.

Medical imaging (X-rays and ultrasound) may be nonexistent. In that case, patients who cannot be diagnosed without imaging should be referred (trauma patients, in particular).

Chapter 1:
A few symptoms and syndromes

Shock

Seizures

Hypoglycaemia *(New)*

Fever

Pain

Anaemia

Severe acute malnutrition

Shock

Acute circulatory failure leading to inadequate tissue perfusion which, if prolonged, results in irreversible organ failure. Mortality is high without early diagnosis and treatment.

Aetiology and pathophysiology

Hypovolaemic shock

Absolute hypovolaemia due to significant intravascular fluid depletion:
– Internal or external haemorrhage: post-traumatic, peri or postoperative, obstetrical (ectopic pregnancy, uterine rupture, etc.), blood loss due to an underlying condition (gastrointestinal ulcer, etc.). A loss of greater than 30% of blood volume in adults will lead to haemorrhagic shock.
– Dehydration: severe diarrhoea and vomiting, intestinal obstruction, diabetic ketoacidosis or hyperosmolar coma, etc.
– Plasma leaks: extensive burns, crushed limbs, etc.

*Relative hypovolaemi***a** due to vasodilation without concomitant increase in intravascular volume:
– Anaphylactic reaction: allergic reaction to insect bites or stings; drugs, mainly neuromuscular blockers, antibiotics, acetylsalicylic acid, colloid solutions (dextran, modified gelatin fluid); equine sera; vaccines containing egg protein; food, etc.
– Acute haemolysis: severe malaria, drug poisoning (rare).

Septic shock

By a complex mechanism, often including vasodilation, heart failure and absolute hypovolaemia.

Cardiogenic shock

By decrease of cardiac output:
– Direct injury to the myocardium: infarction, contusion, trauma, poisoning.
– Indirect mechanism: arrhythmia, constrictive pericarditis, haemopericardium, pulmonary embolism, tension pneumothorax, valvular disease, severe anaemia, beri beri, etc.

Clinical features

Signs common to most forms of shock

– Pallor, mottled skin, cold extremities, sweating and thirst.
– Rapid and weak pulse often only detected on major arteries (femoral or carotid).
– Low blood pressure (BP), narrow pulse pressure, BP sometimes undetectable.
– Capillary refill time (CRT) > 2 seconds.
– Cyanosis, dyspnoea, tachypnoea are often present in varying degrees depending on the mechanism.
– Consciousness usually maintained (more rapidly altered in children), but anxiety, confusion, agitation or apathy are common.
– Oliguria or anuria.

Signs specific to the mechanism of shock

Hypovolaemic shock
The common signs of shock listed above are typical of hypovolaemic shock.
Do not underestimate hypovolaemia. Signs of shock may not become evident until a 50% loss of blood volume in adults.

Anaphylactic shock
– Significant and sudden drop in BP
– Tachycardia
– Frequent cutaneous signs: rash, urticaria, angioedema
– Respiratory signs: dyspnoea, bronchospasm

Septic shock
– High fever or hypothermia (< 36°C), rigors, confusion
– BP may be initially maintained, but rapidly, same pattern as for hypovolaemic shock.

Cardiogenic shock
– Respiratory signs of left ventricular failure (acute pulmonary oedema) are dominant: tachypnoea, crepitations on auscultation.
– Signs of right ventricular failure: raised jugular venous pressure, hepatojugular reflux, sometimes alone, more often associated with signs of left ventricular failure.

The aetiological diagnosis is oriented by:
– The context: trauma, insect bite, ongoing medical treatment, etc.
– The clinical examination:
  • fever
  • skin pinch consistent with dehydration
  • thoracic pain from a myocardial infarction or pulmonary embolus
  • abdominal pain or rigidity of the abdominal wall from peritonitis, abdominal distension from intestinal obstruction
  • blood in stools, vomiting blood in intestinal haemorrhage
  • subcutaneous crepitations, likely anaerobic infection

Management

Symptomatic and aetiological treatment must take place simultaneously.

In all cases

– Emergency: immediate attention to the patient.
– Warm the patient, lay him flat, elevate legs (except in respiratory distress, acute pulmonary oedema).
– Insert a peripheral IV line using a large calibre catheter (16G in adults). If no IV access, use intraosseous route.
– Oxygen therapy, assisted ventilation in the event of respiratory distress.
– Assisted ventilation and external cardiac compression in the event of cardiac arrest.
– Intensive monitoring: consciousness, pulse, BP, CRT, respiratory rate, hourly urinary output (insert a urinary catheter) and skin mottling.

Management according to the cause

Haemorrhage
– Control bleeding (compression, tourniquet, surgical haemostasis).
– Determine blood group.

– Priority: restore vascular volume as quickly as possible:
Insert 2 peripheral IV lines (catheters 16G in adults).
Ringer lactate or **0.9% sodium chloride**: replace 3 times the estimated losses
and/or **plasma substitute**: replace 1.5 times the estimated losses

– Transfuse: classically once estimated blood loss represents approximately 30 to 40% of blood volume (25% in children). The blood must be tested (HIV, hepatitis B and C, syphilis, etc.) Refer to the MSF handbook, *Blood transfusion*.

Severe acute dehydration due to bacterial/viral gastroenteritis

– Urgently restore circulating volume using IV bolus therapy:
Ringer lactate or **0.9% sodium chloride**:
Children < 2 months: 10 ml/kg over 15 minutes. Repeat (up to 3 times) if signs of shock persist.
Children 2-59 months: 20 ml/kg over 15 minutes. Repeat (up to 3 times) if signs of shock persist.
Children ≥ 5 years and adults: 30 mg/kg over 30 minutes. Repeat once if signs of shock persist.

– Then, replace the remaining volume deficit using continuous infusion until signs of dehydration resolve (typically 70 ml/kg over 3 hours).

– Closely monitor the patient; be careful to avoid fluid overload in young children and elderly patients).

Note: in severely malnourished children the IV rate is different than those for healthy children (see Severe acute malnutrition).

Severe anaphylactic reaction

– Determine the causal agent and remove it, e.g. stop ongoing injections or infusions, but if in place, maintain the IV line.

– Administer **epinephrine** (**adrenaline**) IM, into the antero-lateral tight, in the event of hypotension, pharyngolaryngeal oedema, or breathing difficulties:

Use undiluted solution (1:1000 = 1 mg/ml) and a 1 ml syringe graduated in 0.01 ml:
Children under 6 years: 0.15 ml
Children from 6 to 12 years: 0.3 ml
Children over 12 years and adults: 0.5 ml

In children, if 1 ml syringe is not available, use a diluted solution, i.e. add 1 mg epinephrine to 9 ml of 0.9% sodium chloride to obtain a 0.1 mg/ml solution (1:10 000):
Children under 6 years: 1.5 ml
Children from 6 to 12 years: 3 ml

At the same time, administer rapidly **Ringer lactate** or **0.9% sodium chloride**: 1 litre in adults (maximum rate); 20 ml/kg in children, to be repeated if necessary.
If there is no clinical improvement, repeat IM epinephrine every 5 to 15 minutes.

In shock persists after 3 IM injections, administration of IV epinephrine at a constant rate by a syringe pump is necessary:
Use a diluted solution, i.e. add 1 mg epinephrine (1:1000) to 9 ml of 0.9% sodium chloride to obtain a 0.1 mg/ml solution (1:10 000):
Children: 0.1 to 1 microgram/kg/minute
Adults: 0.05 to 0.5 microgram/kg/minute
If syringe pump is not available, see box page 20.

– Corticosteroids have no effect in the acute phase. However, they must be given once the patient is stabilized to prevent recurrence in the short term:
hydrocortisone hemisuccinate IV or IM
Children: 1 to 5 mg/kg/24 hours in 2 or 3 injections
Adults: 200 mg every 4 hours

– In patients with bronchospasm, epinephrine is usually effective. If the spasm persists give 10 puffs of inhaled **salbutamol**.

Septic shock

– Vascular fluid replacement with **Ringer Lactate** or **0.9% sodium chloride** or **plasma substitute**.

– Use of vasoconstrictors:
dopamine IV at a constant rate by syringe pump (see box page 20):
10 to 20 micrograms/kg/minute
or, if not available
epinephrine IV at a constant rate by syringe pump:
Use a *diluted* solution, i.e. add 1 mg epinephrine (1:1000) to 9 ml of 0.9% sodium chloride to obtain a 0.1 mg/ml solution (1:10 000). Start with 0.1 microgram/kg/minute. Increase the dose progressively until a clinical improvement is seen.
If syringe pump is not available, see box page 20.

– Look for the origin of the infection (abscess; ENT, pulmonary, digestive, gynaecological or urological infection etc.). Antibiotic therapy according to the origin of infection:

Origin	Antibiotic therapy	Alternative
Cutaneous staphylococci, streptococci	cloxacillin + gentamicin	
Pulmonary pneumococci, *Haemophilus influenzae*	ampicillin or ceftriaxone +/- gentamicin	co-amoxiclav or ceftriaxone + ciprofloxacin
Intestinal or biliary enterobacteria, anaerobic bacteria, enterococci	co-amoxiclav + gentamicin	ceftriaxone + gentamicin + metronidazole
Gynaecological streptococci, gonococci, anaerobic bacteria, *E. coli*	co-amoxiclav + gentamicin	ceftriaxone + gentamicin + metronidazole
Urinary enterobacteria, enterococci	ampicillin + gentamicin	ceftriaxone + ciprofloxacin
Other or undetermined	ampicillin + gentamicin	ceftriaxone + ciprofloxacin

ampicillin IV
Children and adults: 150 to 200 mg/kg/day in 3 injections (every 8 hours)

cloxacillin IV infusion (60 minutes)
Children over 1 month: 200 mg/kg/day in 4 divided doses (every 6 hours); max. 8 g/day
Adults: 12 g/day in 4 divided doses (every 6 hours)

amoxicillin/clavulanic acid (**co-amoxiclav**) slow IV injection (3 minutes) or IV infusion (30 minutes)
Children less than 3 months: 100 mg/kg/day in 2 divided doses (every 12 hours)
Children ≥ 3 months and < 40 kg: 150 mg/kg/day in 3 divided doses (every 8 hours); max. 6 g/day
Children 40 kg and adults: 6 g/day in 3 divided doses (every 8 hours)

ceftriaxone slow IV[a]
Children: 100 mg/kg as a single injection
Adults: 2 g once daily

ciprofloxacin PO (by nasogastric tube)
Children: 15 to 30 mg/kg/day in 2 divided doses
Adults: 1.5 g/day in 2 divided doses

gentamicin IM or slow IV (3 minutes) or infusion (30 minutes)
Children ≥ 1 month and adults: 6 mg/kg once daily

metronidazole IV infusion (30 minutes)
Children over 1 month: 30 mg/kg/day in 3 divided doses (every 8 hours); max. 1.5 g/day
Adults: 1.5 g/day in 3 divided doses (every 8 hours)

– Corticosteroids: not recommended, the adverse effects outweigh the benefits.

Cardiogenic shock

The objective is to restore efficient cardiac output. The treatment of cardiogenic shock depends on its mechanism.

– *Acute left heart failure with pulmonary oedema*

Acute pulmonary oedema (for treatment, see Heart failure in adults, Chapter 12).

In the event of worsening signs with vascular collapse, use a strong inotrope:
dopamine IV at a constant rate by syringe pump (see box page 20):
3 to 10 micrograms/kg/minute

Once the haemodynamic situation allows (normal BP, reduction in the signs of peripheral circulatory failure), nitrates or morphine may be cautiously introduced.

Digoxin should no longer be used for cardiogenic shock, except in the rare cases when a supraventricular tachycardia has been diagnosed by ECG. Correct hypoxia before using digoxin.
digoxin slow IV
Children: one injection of 0.010 mg/kg (10 micrograms/kg), to be repeated up to 4 times/24 hours if necessary
Adults: one injection of 0.25 to 0.5 mg, then 0.25 mg 3 or 4 times/24 hours if necessary

– *Cardiac tamponade*: restricted cardiac filling as a result of haemopericardium or pericarditis. Requires immediate pericardial tap after restoration of circulating volume.

– *Tension pneumothorax*: drainage of the pneumothorax.

– *Symptomatic pulmonary embolism*: treat with an anticoagulant in a hospital setting.

[a] The solvent of ceftriaxone for IM injection contains lidocaine. Ceftriaxone reconstituted using this solvent must never be administered by IV route. For IV administration, water for injection must always be used.

Administration of **dopamine** or **epinephrine** at a constant rate requires the following conditions:
– close medical supervision in a hospital setting;
– use of a dedicated vein (no other infusion/injection in this vein), avoid the antecubital fossa if possible;
– use of an electric syringe pump (or infusion pump);
– progressive increase and adaptation of doses according to clinical response;
– intensive monitoring of drug administration, particularly during syringe changes.

Example:
dopamine: 10 micrograms/kg/minute in a patient weighing 60 kg
Hourly dose: 10 (micrograms) x 60 (kg) x 60 (min) = 36 000 micrograms/hour = 36 mg/hour
In a 50 ml syringe, dilute one 200 mg-ampoule of dopamine with 0.9% sodium chloride to obtain 50 ml of solution containing 4 mg of dopamine per ml.
For a dose of 36 mg/hour, administer the solution (4 mg/ml) at 9 ml/hour.

If there is no electric syringe pump, dilution in an infusion bag may be considered. However, it is important to consider the risks related to this type of administration (accidental bolus or insufficient dose). The infusion must be constantly monitored to prevent any, even small, change from the prescribed rate of administration.

Example for **epinephrine**:

– In adults:
  Dilute 10 ampoules of 1 mg epinephrine (10 000 micrograms) in 1 litre of 5% glucose or 0.9% sodium chloride to obtain a solution containing 10 micrograms of epinephrine per ml.
  Knowing that 1 ml = 20 drops, *in an adult weighting 50 kg*:
  • 0.1 microgram/kg/minute = 5 micrograms/minute = 10 drops/minute
  • 1 microgram/kg/minute = 50 micrograms/minute = 100 drops/minute, etc.
– In children:
  Dilute 1 ampoule of 1 mg epinephrine (1000 micrograms) in 100 ml of 5% glucose or 0.9% sodium chloride to obtain a solution containing 10 micrograms of epinephrine per ml.
  For administration, use a **paediatric infusion set**; knowing that 1 ml = 60 drops, *in a child weighting 10 kg*:
  • 0.1 microgram/kg/minute = 1 microgram/minute = 6 drops/minute
  • 0.2 microgram/kg/minute = 2 micrograms/minute = 12 drops/minute, etc.

Note: account for all infused volumes when recording ins and outs.

Seizures

– Involuntary movements of cerebral origin (stiffness followed by clonic movements), accompanied by a loss of consciousness, and often urinary incontinence (generalized tonic-clonic seizures).
It is important to distinguish seizures from 'pseudo-seizures' (e.g. in hysteria or tetany) during which consciousness may appear altered but is not lost.

– 2 priorities: stop the seizures and determine the cause. In pregnant women, eclamptic seizures require specific medical and obstetrical care (see Special situation: seizures during pregnancy).

Initial treatment

During a seizure

– Protect from trauma, maintain airway, place patient in 'recovery position', loosen clothing.

– Most seizures are quickly self-limited. Immediate administration of an anticonvulsant is not systematic. If generalized seizure lasts more than 3 minutes, use diazepam to stop it:
diazepam:
Children: 0.5 mg/kg preferably rectally[a] without exceeding 10 mg.
IV administration is possible (0.3 mg/kg over 2 or 3 minutes), only if means of ventilation are available (Ambu bag and mask).
Adults: 10 mg rectally or slowly IV.
In all cases:
- Dilute 10 mg (2 ml) of diazepam in 8 ml of 5% glucose or 0.9% sodium chloride.
- If convulsion continues, repeat dose once after 5 minutes.
- In infants and elderly patients, monitor respiration and blood pressure.
- If convulsion continues after the second dose, treat as status epilepticus.

The patient is no longer seizing

– Look for the cause of the seizure and evaluate the risk of recurrence.

– Keep diazepam and glucose available in case the patient starts seizing again.

Status epilepticus

Several distinct seizures without complete restoration of consciousness in between or an uninterrupted seizure lasting more than 10 minutes.

– Protect from trauma, loosen clothing, maintain airway and administer oxygen as required.

– Insert an IV line.

– Administer 5 ml/kg of **10% glucose** by IV (over 2 to 3 minutes) in children and 1 ml/kg of **50% glucose** by slow IV (over 3 to 5 minutes) in adults.

[a] For rectal administration, use a syringe without a needle, or better, cut a nasogastric tube, CH8, to a length of 2-3 cm and attach it to the tip of the syringe.

– If diazepam (see above) has not stopped the seizure, continue with **phenobarbital** by IV infusion:
  Children under 12 years: 20 mg/kg (max. 1 g) in 5 ml/kg of 0.9% sodium chloride or 5% glucose for children < 20 kg and in 100 ml of 0.9% sodium chloride or 5% glucose for children ≥ 20 kg, administered over 20 minutes minimum (never exceed 1 mg/kg/minute). If necessary, a second dose of 10 mg/kg may be administered (as above) 15 to 30 minutes after the first dose.
  Children over 12 years and adults: 10 mg/kg (max. 1 g) in 100 ml of 0.9% sodium chloride or 5% glucose administered over 20 minutes minimum (never exceed 1 mg/kg/minute). If necessary, a second dose of 5 to 10 mg/kg may be administered (as above) 15 to 30 minutes after the first dose.

  IM route may be an alternative when an IV (or intraosseous) access cannot be obtained.

  ⚠ There is a high risk of respiratory depression and hypotension, especially in children and elderly patients. Never administer phenobarbital by rapid IV injection. Monitor closely respiration and blood pressure. Ensure that respiratory support (Ambu bag via face mask or intubation) and IV solutions for fluid replacement are ready at hand.

Further treatment

Febrile seizures

– Determine the cause of the fever. Give paracetamol (see Fever), undress the patient, wrap in damp cloth.
– In children under 3 years, there is usually no risk of later complications after simple febrile seizures and no treatment is required after the crisis. For further febrile episodes, give paracetamol PO.

Infectious causes

Severe malaria (Chapter 6), meningitis (Chapter 7), meningo-encephalitis, cerebral toxoplasmosis (HIV infection and AIDS, pages 233-234, Chapter 8), cysticercosis (Cestodes, Chapter 6), etc.

Metabolic causes

– Hypoglycaemia: administer glucose by slow IV injection (for administration, see previous page) to all patients who do not regain consciousness, to patients with severe malaria and to newborns and malnourished children. When possible, confirm hypoglycaemia (reagent strip test).

Iatrogenic causes

– Withdrawal of antiepileptic therapy in a patient being treated for epilepsy should be managed over a period of 4-6 months with progressive reduction of the doses. An abrupt stop of treatment may provoke severe recurrent seizures.

Epilepsy

– A first brief seizure does not need further protective treatment. Only patients with chronic repetitive seizures require further regular protective treatment with an antiepileptic drug, usually over several years.
– Once a diagnosis is made, abstention from treatment may be recommended due to the risks associated with treatment. However, these risks must be balanced with the risks of aggravation of the epilepsy, ensuing seizure-induced cerebral damage and other injury if the patient is not treated.

– It is always preferable to start with monotherapy. The effective dose must be reached progressively and symptoms and drug tolerance evaluated every 15 to 20 days.
– An abrupt interruption of treatment may provoke status epilepticus. The rate of dose reduction varies according to the length of treatment; the longer the treatment period, the longer the reduction period (see Iatrogenic causes). In the same way, a change from one antiepileptic drug to another must be made progressively with an overlap period of a few weeks.
– First line treatments for generalised tonic-clonic seizures in children under 2 years are carbamazepine or phenobarbital, in older children and adults sodium valproate or carbamazepine. For information:

sodium valproate PO
Children over 20 kg: initial dose of 400 mg in 2 divided doses irrespective of weight; if necessary, increase the dose progressively until the optimal dose for the individual has been reached (usually 20 to 30 mg/kg/day in 2 divided doses).
Adults: initial dose of 600 mg/day in 2 divided doses; increase by 200 mg/day every 3 days until the optimal dose for the individual has been reached (usually 1 to 2 g/day in 2 divided doses).

carbamazepine PO
Children: initial dose of 2 mg/kg/day in 1 or 2 divided doses; increase every week until the optimal dose for the individual has been reached (usually 10 to 20 mg/kg/day in 2 to 4 divided doses).
Adults: initial dose of 200 mg/day in 1 or 2 divided doses; increase by 200 mg every week until the optimal dose for the individual has been reached (usually 800 to 1200 mg/day in 2 to 4 divided doses).

phenobarbital PO
Children: initial dose of 3 to 4 mg/kg/day at night, increase the dose progressively to 8 mg/kg/day if necessary
Adults: initial dose of 2 mg/kg/day at night (without exceeding 100 mg per day), increase the dose progressively to 6 mg/kg/day if necessary

Special situation: seizures during pregnancy

Eclampsia

Seizures during the third trimester of pregnancy, most commonly in the context of pre-eclampsia (hypertension, oedema and proteinuria on reagent-strip test).

– Symptomatic treatment of eclampsia:
Treatment of choice is **magnesium sulfate** (5 g ampoule, 500 mg/ml, 10 ml) by IV infusion: 4 g diluted in 0.9% sodium chloride to be administered over 15 minutes. Then infuse 1 g/hour, continue magnesium sulfate for 24 hours following delivery or the last seizure. If seizure recurs, give another 2 g by slow IV injection (over 15 minutes).
Monitor urine output. Stop the treatment if urinary output is less than 30 ml/hour or 100 ml/4 hours.

⚠ Before each injection, verify the concentration written on the ampoules: it comes in different concentrations.
Always have calcium gluconate ready to reverse the effects of magnesium sulfate in the event of toxicity.

Monitor patellar tendon reflex every 15 minutes during the infusion. If the patient has malaise, drowsiness, difficulty speaking or loss of patellar reflex: stop the magnesium sulfate and inject 1 g of **calcium gluconate** by slow, direct IV injection (over 5 to 10 minutes).

Only in the absence of magnesium sulfate, use **diazepam**: 10 mg slow IV followed by 40 mg in 500 ml 5% glucose as a continuous infusion over 24 hours. If there is no venous access for the loading dose, give 20 mg rectally. In the event of treatment failure after 10 minutes, give a second dose of 10 mg.
For direct IV or rectal administration dilute diazepam in 5% glucose or 0.9% sodium chloride to make a total volume of 10 ml.

- Oxygen: 4 to 6 litres/minute.
- Nursing, hydration.
- Urgent delivery within 12 hours.
- Treatment of hypertension: see Hypertension (Chapter 12).

Other causes

During pregnancy, consider that seizures may also be caused by cerebral malaria or meningitis; the incidence of these diseases is increased in pregnant women. See Malaria (Chapter 6) and Bacterial meningitis (Chapter 7).

Hypoglycaemia

Hypoglycaemia is an abnormally low concentration of blood glucose. Severe hypoglycaemia can be fatal or lead to irreversible neurological damage.

Blood glucose levels should be measured whenever possible in patients presenting symptoms of hypoglycaemia. If hypoglycaemia is suspected but blood glucose measurement is not available, glucose (or another available sugar) should be given empirically.

Always consider hypoglycaemia in patients presenting impaired consciousness (lethargy, coma) or seizures.

For diagnosis and treatment of hypoglycaemia in neonates, see *Essential obstetric and newborn care*, MSF.

Clinical features

Rapid onset of non-specific signs, mild to severe depending on the degree of the hypoglycaemia: sensation of hunger and fatigue, tremors, tachycardia, pallor, sweats, anxiety, blurred vision, difficulty speaking, confusion, convulsions, lethargy, coma.

Diagnosis

Capillary blood glucose concentration (reagent strip test):
- Non-diabetic patients:
  - Hypoglycaemia: < 60 mg/dl (< 3.3 mmol/litre)
  - Severe hypoglycaemia: < 40 mg/dl (< 2.2 mmol/litre)
- Diabetic patients on home treatment: ≤ 70 mg/dl (3.9 mmol/litre)

If blood glucose measurement is not available, diagnosis is confirmed when symptoms resolve after the administration of sugar or glucose.

Symptomatic treatment

- Conscious patients:
  Children: a teaspoon of powdered sugar in a few ml of water or 50 ml of fruit juice, maternal or therapeutic milk or 10 ml/kg of 10% glucose by oral route or nasogastric tube.
  Adults: 15 to 20 g of sugar (3 or 4 cubes) or sugar water, fruit juice, soda, etc.
  Symptoms improve approximately 15 minutes after taking sugar by oral route.
- Patients with impaired consciousness or prolonged convulsions:
  Children: 5 ml/kg of **10% glucose** by IV route (2 to 3 minutes) or infusion
  Adults: 1 ml/kg of **50% glucose** by slow IV (3 to 5 minutes)
  Neurological symptoms improve a few minutes after the injection.

Check blood glucose after 15 minutes. If it is still low, re-administer glucose by IV route or sugar by oral route according to the patient's clinical condition.

If there is no clinical improvement, differential diagnoses should be considered: e.g. serious infection (severe malaria, meningitis, etc.), epilepsy.

In all cases, after stabilisation, give a meal or snack rich in complex carbohydrates and monitor the patients for a few hours.

If patient does not return to full alertness after an episode of severe hypoglycaemia, monitor blood glucose levels regularly.

Treat the cause

– Other than diabetes:
  - Treat severe malnutrition, neonatal sepsis, severe malaria, acute alcohol intoxication, etc.
  - End prolonged fast.
  - Replace drugs inducing hypoglycaemia (e.g. quinine IV, pentamidine, ciprofloxacin, enalapril, beta-blockers, high-dose aspirin, tramadol), or anticipate hypoglycaemia (e.g. administer quinine IV in a glucose infusion).

– In diabetic patients:
  - Avoid missing meals, increase intake of carbohydrates if necessary.
  - Adjust dosage of insulin according to blood glucose levels and physical activity (see Diabetes type 1, Chapter 12).
  - Adjust dosage of oral antidiabetics, taking into account possible drug interactions (see Diabetes type 2, Chapter 12).

Fever

- Fever is defined as a rectal temperature higher than or equal to 38°C.
- In practice, axillary route is easier, more accepted and more hygienic. An axillary temperature higher than or equal to 37.5°C is considered a fever. In a child under 3 years, if the axillary temperature is ≥ 37.5°C, take the temperature rectally if possible.

  ⚠ Record the temperature as measured and if taken using the rectal or axillary route. Do not add 0.5°C to the axillary temperature. Use an electronic thermometer.
- Fever is frequently due to infection. In a febrile patient, first look for signs of serious illness then, try to establish a diagnosis. There is an increased risk of severe bacterial infection[a] if the rectal temperature is ≥ 38°C in children 0 to 2 months; ≥ 38.5°C in children 2 months to 3 years; ≥ 39°C in children older than 3 years and adults.

Signs of severity

- Severe tachycardia, tachypnoea, respiratory distress, oxygen saturation ≤ 90%.
- Shock, altered mental status, petechial or purpuric rash, meningeal signs, seizures, heart murmur, severe abdominal pain, dehydration, critically ill appearance[b]; a bulging fontanel in young children.

Infectious causes of fever according to localizing symptoms

Signs or symptoms	Possible aetiology
Meningeal signs, seizures	Meningitis/meningoencephalitis/severe malaria
Abdominal pain or peritoneal signs	Appendicitis/peritonitis/typhoid fever
Diarrhoea, vomiting	Gastroenteritis/typhoid fever
Jaundice, enlarged liver	Viral hepatitis
Cough	Pneumonia/measles/tuberculosis if persistent
Ear pain, red tympanic membrane	Otitis media
Sore throat, enlarged lymph nodes	Streptococcal pharyngitis, diphtheria
Dysuria, urinary frequency, back pain	Urinary tract infection
Red, warm, painful skin	Erysipelas, cellulitis, abscess
Limp, difficulty walking	Osteomyelitis/septic arthritis
Rash	Measles/dengue/haemorrhagic fever/Chikungunya
Bleeding (petechiae, epistaxis, etc.)	Dengue/haemorrhagic fever
Joint pain	Rheumatic fever/Chikungunya/dengue

[a] Malnourished or immune-depressed children may have a bacterial infection without a fever.

[b] Critically ill appearing child: weak grunting or crying, drowsiness, difficult to arrouse, does not smile, unconjugate or anxious gaze, pallor or cyanosis, general hypotonia.

– In endemic area, always consider malaria.
– If the patient is ill appearing[c] and has a persistent fever, consider HIV infection and tuberculosis, according to clinical presentation.

Laboratory and other examinations

– Children less than 2 months with a rectal temperature ≥ 38°C without a focus:
  • Urinary dipstick;
  • Lumbar puncture (LP) if child less than 1 month or if any of the following: meningeal signs, coma, seizures, critically ill appearance[c], failure of prior antibiotic therapy, suspicion of staphylococcal infection;
  • Chest X-Ray (if available) in case of signs of respiratory disease.
– Children 2 months to 3 years with a rectal temperature ≥ 38.5°C without a focus:
  • Urine dipstick;
  • White blood cell count (WBC) if available;
  • LP if meningeal signs.
– Children over 3 years and adults with an axillary or rectal temperature ≥ 39°C:
  According to clinical presentation.

Treatment

– Treat according to the cause of fever.
– For patients with sickle cell disease, see Sickle cell disease, Chapter 12.
– If no source of infection is found, hospitalise and treat the following children with empiric antibiotics:
  • Children less than 1 month;
  • Children 1 month to 3 years with WBC ≥ 15000 or ≤ 5000 cells/mm^3;
  • All critically ill appearing[c] patients or those with signs of serious illness;
  For antibiotic doses according to age, see Acute pneumonia, Chapter 2.

Symptomatic treatment

– Undress the patient. Do not wrap children in wet towels or cloths (not effective, increases discomfort, risk of hypothermia).
– Antipyretics may increase the patient's comfort but they do not prevent febrile convulsions. Do not treat for more than 3 days with antipyretics.

paracetamol PO
Children less than 1 month: 10 mg/kg/dose, 3 to 4 times daily as needed
Children 1 month and over: 15 mg/kg/dose, 3 to 4 times daily as needed (max. 60 mg/kg/day)
Adults: 1 g/dose, 3 to 4 times daily as needed (max. 4 g/day)
or
ibuprofen PO
Children over 3 months and < 40 kg: 10 mg/kg/dose, 3 times daily as needed (max. 1200 mg/day)
Children ≥ 40 kg and adults: 400 mg/dose, 3 times daily as needed
or
acetylsalicylic acid (**ASA**) PO
Children over 15 years and adults: 1 g/dose, 3 times daily as needed

[c] Critically ill appearing child: weak grunting or crying, drowsiness, difficult to arrouse, does not smile, unconjugate or anxious gaze, pallor or cyanosis, general hypotonia.

Prevention of complications

– Encourage oral hydration. Continue frequent breastfeeding in infants.
– Watch for signs of dehydration.
– Monitor urine output.

Notes:
– In pregnant or breast-feeding women use paracetamol only.
– In case of haemorrhagic fever and dengue: acetylsalicylic acid and ibuprofen are contra-indicated; use paracetamol with caution in the presence of hepatic dysfunction.

Pain

Pain results from a variety of pathological processes. It is expressed differently by each patient depending on cultural background, age, etc. It is a highly subjective experience meaning that only the individual is able to assess his/her level of pain. Regular assessment of the intensity of pain is indispensable in establishing effective treatment.

Clinical features

Pain assessment

- Intensity: use a simple verbal scale in children over 5 years and adults, and NFCS or FLACC scales in children less than 5 years (see pain rating scales on following page).
- Pattern: sudden, intermittent, chronic; at rest, at night, on movement, during care procedures, etc.
- Character: burning, cramping, spasmodic, radiating, etc.
- Aggravating or relieving factors, etc.

Clinical examination

- Of the organ or area where the pain is located.
- Specific signs of underlying disease (e.g. bone or osteoarticular pain may be caused by a vitamin C deficiency) and review of all systems.
- Associated signs (fever, weight loss, etc.).

Synthesis

The synthesis of information gathered during history taking and clinical examination allows aetiological diagnosis and orients treatment. It is important to distinguish:

- *Nociceptive* pain: it presents most often as acute pain and the cause-effect relationship is usually obvious (e.g. acute post-operative pain, burns, trauma, renal colic, etc.). The pain may be present in different forms, but neurological exam is normal. Treatment is relatively well standardized.
- *Neuropathic* pain, due to a nerve lesion (section, stretching, ischaemia): most often chronic pain. On a background of constant, more or less localized pain, such as paraesthesia or burning, there are recurrent acute attacks such as electric shock-like pain, frequently associated with disordered sensation (anaesthesia, hypo or hyperaesthesia). This type of pain is linked to viral infections directly affecting the CNS (herpes simplex, herpes zoster), neural compression by tumors, post- amputation pain, paraplegia, etc.
- *Mixed* pain (cancer, HIV) for which management requires a broader approach.

Pain evaluation scales

Self-evaluation scale - Children over 5 years and adults

Simple verbal scale (SVS)

Intensity of pain	No pain	Mild pain	Moderate pain	Severe pain
Scoring	0	1	2	3
Write down	0	+	++	+++

Observational evaluation scale - Children 2 months-5 years

FLACC scale (Face Limb Activity Cry Consolability)

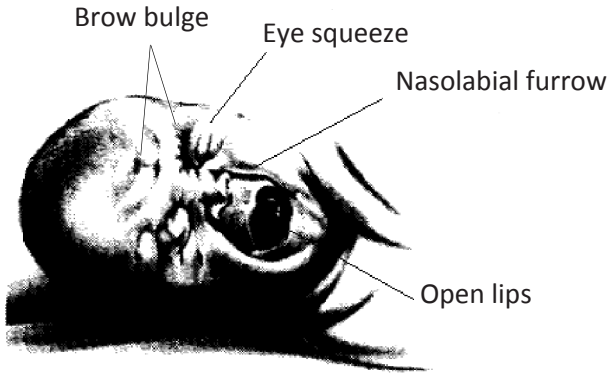
Items	Scoring		
	0	1	2
Face	No particular expression or smile	Occasional grimace or frown, withdrawn, disinterested	Frequent to constant frown, clenched jaw, quivering chin
Legs	Normal position or relaxed	Uneasy, restless, tense	Kicking, or legs drawn up
Activity	Lying quietly, normal position, moves easily	Squirming, shifting back and forth, tense	Arched, rigid or jerking
Cry	No cry (awake or asleep)	Moans or whimpers, occasional complaint	Crying steadily, screams or sobs, frequent complaints
Consolability	Content, relaxed	Reassured by occasional touching, hugging or being talked to, distractible	Difficult to console or comfort

Each category is scored from 0 to 2, giving a final score between 0 and 10.
0 to 3: mild pain, 4 to 7: moderate pain, 7 to 10: severe pain

Observational evaluation scale - Children under 2 months

NFCS scale (Neonatal Facial Coding System)

Items	Scoring	
	0	1
Brow bulge	no	yes
Eye squeeze	no	yes
Nasolabial furrow	no	yes
Open lips	no	yes



A score of 2 or more signifies significant pain, requiring analgesic treatment.

Treatment

Treatment depends on the type and intensity of the pain. It may be both aetiological and symptomatic if a treatable cause is identified. Treatment is symptomatic only in other cases (no cause found, non-curable disease).

Nociceptive pain

The WHO classifies analgesics used for this type of pain on a three-step ladder:

– *Step 1*: non-opioid analgesics such as paracetamol and nonsteroidal anti-inflammatory drugs (NSAIDs).

– *Step 2*: weak opioid analgesics such as codeine and tramadol. Their combination with one or two Step 1 analgesics is recommended.

– *Step 3*: strong opioid analgesics, first and foremost morphine. Their combination with one or two Step 1 analgesics is recommended.

The treatment of pain is based on a few fundamental concepts:

– Pain can only be treated correctly if it is correctly evaluated. The only person who can evaluate the intensity of pain is the patient himself. The use of pain assessment scales is invaluable.

– The pain evaluation observations should be recorded in the patient chart in the same fashion as other vital signs.

– Treatment of pain should be as prompt as possible.

– It is recommended to administer analgesics in advance when appropriate (e.g. before painful care procedures).

– Analgesics should be prescribed and administered at fixed time intervals (not on demand).

– Oral forms should be used whenever possible.

– The combination of different analgesic drugs (multimodal analgesia) is advantageous.

– Start with an analgesic from the level presumed most effective: e.g., in the event of a fractured femur, start with a Step 3 analgesic.

– The treatment and dose chosen are guided by the assessment of pain intensity, but also by the patient's response which may vary significantly from one person to another.

Treatment of acute pain

Mild pain	Paracetamol + /- NSAID
Moderate pain	Paracetamol + /- NSAID + tramadol or codeine
Severe pain	Paracetamol + /- NSAID + morphine

	Analgesics	Children	Adults (except pregnant/ breast-feeding women)	Remarks
Level 1	**paracetamol** PO	15 mg/kg every 6 hours or 10 mg/kg every 4 hours	500 mg to 1 g every 4 to 6 hours (max. 4 g/day)	The efficacy of IV paracetamol is not superior to the efficacy of oral paracetamol; the IV route is restricted to situations where oral administration is impossible.
	paracetamol IV	< 10 kg: 7.5 mg/kg every 6 hours (max. 30 mg/kg/day) > 10 kg: 15 mg/kg every 6 hours (max. 60 mg/kg/day)	≤ 50 kg: 15 mg/kg every 6 hours (max. 60 mg/kg/day) > 50 kg: 1 g every 6 hours (max. 4 g/day)	
	acetylsalicylic acid (**aspirin**) PO	–	300 mg to 1 g every 4 to 6 hours (max. 4 g/day)	Avoid in children less than 16 years.
	diclofenac IM	–	75 mg once daily	Treatment must be as short as possible. Respect contra-indications.
	ibuprofen PO	> 3 months: 30 mg/kg/day in 3 divided doses	1200 to 1800 mg/day in 3 to 4 divided doses	
Level 2	**codeine** PO	> 12 years: 30 to 60 mg every 4 to 6 hours (max. 240 mg/day)	30 to 60 mg every 4 to 6 hours (max. 240 mg/day)	Add a laxative if treatment > 48 hours.
	tramadol PO	> 12 years: 50 to 100 mg every 4 to 6 hours (max. 400 mg/day)	50 to 100 mg every 4 to 6 hours (max. 400 mg/day)	25 to 50 mg every 12 hours in elderly patients and in patients with severe renal or hepatic impairment.
	tramadol IM, slow IV or infusion	> 12 years: 50 to 100 mg every 4 to 6 hours (max. 600 mg/day)	50 to 100 mg every 4 to 6 hours (max. 600 mg/day)	

	Analgesics	Children	Adults (except pregnant/ breast-feeding women)	Remarks
Level 3	**morphine** PO immediate release (MIR)	> 6 months: 1 mg/kg/day in 6 divided doses at 4 hour-intervals, to be ajusted in relation to pain intensity	60 mg/day in 6 divided doses at 4 hour-intervals, to be ajusted in relation to pain intensity	• Reduce the dose (30 mg/day) in elderly patients and patients with renal or hepatic impairment. • Add a laxative if treatment > 48 hours.
	morphine PO slow release (MSR)	The effective daily dose is determined during the initial treatment with immediate release morphine (MIR). If treatment is initiated directly with MSR: > 6 months: 1 mg/kg/day in 2 divided doses at 12 hour-intervals, to be ajusted in relation to pain intensity	The effective daily dose is determined during the initial treatment with immediate release morphine (MIR). If treatment is initiated directly with MSR: 60 mg/day in 2 divided doses at 12 hour-intervals, to be ajusted in relation to pain intensity	• Do not initiate treatment with the sustained release morphine in elderly patients or those with renal or hepatic impairment. Begin treatment with the immediate release morphine (MIR). • Add a laxative if treatment > 48 hours.
	morphine SC, IM	> 6 months: 0.1 to 0.2 mg/kg every 4 hours	0.1 to 0.2 mg/kg every 4 hours	• In elderly patients and in patients with severe renal or hepatic impairment: reduce doses by half and administer less frequently, according to clinical response. • Add a laxative if treatment > 48 hours.
	morphine IV	> 6 months: 0.1 mg/kg administered in fractionated doses (0.05 mg/kg every 10 minutes), to be repeated every 4 hours if necessary	0.1 mg/kg administered in fractionated doses (0.05 mg/kg every 10 minutes), to be repeated every 4 hours if necessary	

Notes on the use of morphine and derivatives:

– Morphine is an effective treatment for many types of severe pain. Its analgesic effect is dose-dependent. Its adverse effects have often been exaggerated and should not be an obstacle to its use.

– The most serious adverse effect of morphine is respiratory depression, which may be fatal. This adverse effect results from overdose. It is, therefore, important to increase doses gradually. Respiratory depression is preceded by drowsiness, which is a warning to monitor respiratory rate (RR).
The RR should remain equal to or greater than the thresholds indicated below:

Neonate	RR ≥ 35 respirations/min
Children 1 to 12 months	RR ≥ 25 respirations/min
Children 1 to 2 years	RR ≥ 20 respirations/min
Children 2 to 5 years	RR ≥ 15 respirations/min
Children > 5 years and adults	RR ≥ 10 respirations/min

Respiratory depression must be identified and treated quickly: verbal and physical stimulation of the patient; administration of oxygen; respiratory support (bag and mask) if necessary. If no improvement, administer **naloxone** (antagonist of morphine) in bolus of 1 to 3 micrograms/kg as necessary until RR normalises and the excessive drowsiness resolves.

– Morphine and codeine always cause constipation. A laxative should be prescribed if the opioid treatment continues more than 48 hours. **Lactulose** PO is the drug of choice: children < 1 year: 5 ml/day; children 1-6 years: 5 to 10 ml/day; children 7-14 years: 10 to 15 ml/day; adults: 15 to 45 ml/day.
If the patient's stools are soft, a stimulant laxative (**bisacodyl** PO: children > 3 years: 5 to 10 mg/day; adults: 10 to 15 mg/day) is preferred.

– Nausea and vomiting are common at the beginning of treatment.
Adults:
haloperidol PO (2 mg/ml oral solution): 1 to 2 mg to be repeated up to 6 times daily
or **metoclopramide** PO: 15 to 30 mg/day in 3 divided doses with an interval of at least 6 hours between each dose
Do not combine haloperidol and metoclopramide.
Children:
ondansetron PO: 0.15 mg/kg to be repeated up to 3 times daily. Do not exceed 4 mg/dose.
Do not use metoclopramide in children.

– For chronic pain in late stage disease (cancer, AIDS etc.), morphine PO is the drug of choice. It may be necessary to increase doses over time according to pain assessment. Do not hesitate to give sufficient and effective doses.

– Morphine, tramadol and codeine have similar modes of action and should not be combined.

– Buprenorphine, nalbuphine and pentazocine must not be combined with morphine, pethidine, tramadol or codeine because they have competitive action.

Treatment of nociceptive pain in pregnant and breast-feeding women

Analgesics		Pregnancy		Breast-feeding
		0-5 months	From 6th month	
Level 1	**paracetamol**	1st choice	1st choice	1st choice
	aspirin	avoid	contra-indicated	avoid
	ibuprofen	avoid	contra-indicated	possible
Level 2	**codeine**	possible	The newborn infant may develop withdrawal symptoms, respiratory depression and drowsiness in the event of prolonged administration of large doses at the end of the 3rd trimester. Closely monitor the newborn infant.	Use with caution, for a short period (2-3 days), at the lowest effective dose. Monitor the mother and the child: in the event of excessive drowsiness, stop treatment.
	tramadol	possible	The child may develop drowsiness when the mother receives tramadol at the end of the 3rd trimester and during breast-feeding. Administer with caution, for a short period, at the lowest effective dose, and monitor the child.	
Level 3	**morphine**	possible	The child may develop withdrawal symptoms, respiratory depression and drowsiness when the mother receives morphine at the end of the 3rd trimester and during breast-feeding. Administer with caution, for a short period, at the lowest effective dose, and monitor the child.	

Neuropathic pain

Commonly used analgesics are often ineffective in treating this type of pain.

Treatment of neuropathic pain is based on a combination of two centrally acting drugs:

amitriptyline PO
Adults: start with a dose of 10 to 25 mg/day at night and increase progressively to reach an effective dose, without exceeding 150 mg/day. Reduce the dose by 1/2 in elderly patients.

carbamazepine PO
Adults: start with a dose of 200 mg once daily at night for one week, then 400 mg/day in 2 divided doses (morning and night) for one week, then 600 mg/day in 3 divided doses.
Given its teratogenic risk, carbamazepine should only be used in women of childbearing age when covered by non-hormonal contraception (copper intrauterine device).

Mixed pain

In mixed pain with a significant component of nociceptive pain, such as in cancer or AIDS, morphine is combined with antidepressants and antiepileptics.

Chronic pain

In contrast to acute pain, medical treatment alone is not always sufficient in controlling chronic pain. A multidisciplinary approach including medical treatment, physiotherapy, psychotherapy and nursing is often necessary to allow good pain relief and encourage patient self-management.

Co-analgesics

The combination of certain drugs may be useful or even essential in the treatment of pain: antispasmodics, muscle relaxants, anxiolytics, corticosteroids, local anaesthesia, etc.

Anaemia

– Anaemia is defined as a haemoglobin level below reference values[a]. It is a frequent symptom in tropical settings where 10 to 20% of the population present with Hb levels less than 10 g/dl.
– Anaemia is caused by:
  • *decreased production of red blood cells*: nutritional iron and/or folic acid deficiency, depressed bone marrow function, some infections (HIV, visceral leishmaniasis etc.);
  • *loss of red blood cells*: acute or chronic haemorrhage (ancylostomiasis etc.);
  • *increased destruction of red blood cells (haemolysis)*: malaria; infections or the intolerance of certain drugs by patients with G6PD deficiency (primaquine, dapsone, cotrimoxazole, nalidixic acid, nitrofuran derivatives etc.); haemoglobinopathies (sickle cell disease, thalassaemias); certain bacterial and viral infections (HIV).
– In tropical settings, the causes are often interlinked, the two most common causes are nutritional deficiencies and malaria. The groups most at risk are children and young women, particularly during pregnancy.
– Anaemia in itself is not an indication for transfusion. Most anaemias are well tolerated and can be corrected with simple aetiological treatment.

Clinical features

– Common signs of anaemia: pallor of the conjunctivae, mucous membranes, palms of hands and soles of feet; fatigue, dizziness, oedema in the lower limbs, dyspnoea, tachycardia, heart murmur.
– Signs that anaemia may be immediately life threatening: sweating, thirst, cold extremities, tachycardia, respiratory distress and shock.
– Look for signs of a specific pathology: cheilosis, nutritional deficiency glossitis, haemolytic jaundice, signs of malaria (Chapter 6), etc.

Laboratory

– Haemoglobin level (or if haemoglobin is not available, haematocrit)
– Thick and thin blood films or rapid test if malaria is suspected

Treatment

Iron deficiency anaemia

– **elemental iron** PO[b] for 3 months
  Children under 2 years: 30 mg once daily = 1/2 tab/day
  Children from 2 to 12 years: 60 mg once daily = 1 tab/day
  Adults: 120 to 180 mg/day in 2 or 3 divided doses = 2 to 3 tab/day
  or preferably, give a combination of **elemental iron** (65 mg) + **folic acid** (400 micrograms) PO.

[a] Normal values: > 13 g/dl in men; > 12 g/dl in women; > 11 g/dl in pregnant women; > 13.5 g/dl in newborns; > 9.5 g/dl in infants from 2 to 6 months; > 11 g/dl in children from 6 months to 6 years; > 11.5 g/dl in children from 6 to 12 years.

[b] Doses are calculated in elemental iron. Tablets of 200 mg ferrous sulphate such as those of ferrous sulphate + folic acid contain 65 mg of elemental iron. 300 mg tablets of ferrous gluconate contain 35 mg of elemental iron.

– Combine with an anthelminthic:
albendazole PO (except during the first trimester of pregnancy)
Children > 6 months and adults: 400 mg as a single dose
(Children > 6 months but < 10 kg: 200 mg as a single dose)
or
mebendazole PO (except during the first trimester of pregnancy)
Children > 6 months and adults: 200 mg/day in 2 divided doses for 3 days
(Children > 6 months but < 10 kg: 100 mg/day in 2 divided doses for 3 days)

Folic acid deficiency anaemia (rarely isolated)

– **folic acid** PO
Children under 1 year: 0.5 mg/kg once daily for 4 months
Children over 1 year and adults: 5 mg once daily for 4 months

Haemolytic anaemia

– Malaria: iron is ineffective except in patients with an associated iron deficiency. For the treatment of malaria, see Chapter 6.

– G6PD deficiency: no specific treatment; early treatment of infections; stop any drugs suspected to be causing a reaction.

Immediately life threatening anaemia

– Oxygen, particularly for children.

– Transfusion after determination of blood group and type and screening for HIV, hepatitis B and C, syphilis, malaria in endemic areas. To determine the blood volume required and the rate of transfusion, see next page.

Note: the prevalence of HIV infection makes screening of donors vital. If there is no possibility of screening, it is up to the physician to weigh the transfusion risk with the life or death risk of not transfusing the patient. All transfusions that are not strictly indicated are strictly contra-indicated.

Adults	
Determine the *volume* of whole blood to be transfused: V = (haemoglobin required **minus** patient's haemoglobin) **multiplied** by 6 **multiplied** by patient's weight	Example: haemoglobin required = 7 g/dl patient's haemoglobin = 4 g/dl patient's weight = 60 kg Volume in ml = (7 – 4) x 6 x 60 = 1080 ml
Determine the *transfusion rate*: (1 ml of whole blood = 15 drops)	Example: 1080 ml to be administered over 3 hours 1080 (ml) ÷ 180 (minutes) = 6 ml/minute 6 (ml) x 15 (drops) = 90 drops/minute
Children	
Newborns and children under 1 year: 15 ml/kg over 3 to 4 hours Children over 1 year: 20 ml/kg over 3 to 4 hours Malnourished children: 10 ml/kg over 3 hours	Example: a malnourished child weighing 25 kg 10 (ml) x 25 (kg) = 250 ml over 3 hours 250 (ml) ÷ 180 (minutes) = 1.4 ml/minute 1.4 (ml) x 15 (drops) = 21 drops/minute

Monitor vital signs (pulse, blood pressure, respiratory rate, temperature) and watch for clinical signs of transfusion reactions.

In some cases, particularly in children suffering from severe malaria, anaemia may cause heart failure which may be decompensated by transfusion. If signs of hypervolaemia are seen:
furosemide slow, direct IV
1 mg/kg without exceeding 20 mg/kg.

– If present, treat any pulmonary or parasitic infection (malaria).

Prevention

– Iron or folic acid deficiency:
  • drug supplements in pregnant woman:
    elemental iron (65 mg) + **folic acid** (400 micrograms) PO
    60 mg once daily = 1 tab/day
  • Nutritional supplements if the basic diet is insufficient.
– For sickle cell anaemia, see Sickle cell disease (Chapter 12).
– Early treatment of malaria, helminthic infections etc.

Severe acute malnutrition

Severe acute malnutrition is caused by a significant imbalance between nutritional intake and individual needs. It is most often caused by both quantitative (number of kilocalories/day) and qualitative (vitamins and minerals, etc.) deficiencies.

Children over 6 months of age

The two principal forms of severe malnutrition are:

– *Marasmus*: significant loss of muscle mass and subcutaneous fat, resulting in a skeletal appearance.

– *Kwashiorkor*: bilateral oedema of the lower limbs/oedema of the face, often associated with cutaneous signs (shiny or cracked skin, burn-like appearance; discoloured and brittle hair).

The two forms may be associated (marasmic-kwashiorkor).

In addition to these characteristic signs, severe acute malnutrition is accompanied by significant physiopathological disorders (metabolic disturbances, anaemia, compromised immunity, leading to susceptibility to infections often difficult to diagnose, etc.).
Complications are frequent and potentially life-threatening.
Mortality rates may be elevated in the absence of specific medical management.

Admission and discharge criteria for treatment programmes for severe acute malnutrition are both anthropometric and clinical:

– Mid-upper arm circumference (MUAC) is the circumference, measured in mid- position, of the relaxed left upper arm, taken in children of 6 to 59 months (65 to 110 cm in height). MUAC measures the degree of muscle wasting. A MUAC of < 115 mm indicates severe malnutrition and significant mortality risk.

– Weight for height (W/H) index assesses the degree of weight loss by comparing the weight of the malnourished child with non-malnourished children of the same height. Severe malnutrition is defined as a W/H index of < – 3Z with reference to the new WHO child growth standards[a].

– The presence of bilateral oedema of the lower limbs (when other causes of oedema have been ruled out) indicates severe malnutrition, regardless of the MUAC and W/H.

Usual admission criteria are: MUAC < 115 mm (MUAC is not used as an admission criterion in children older than 59 months or taller than 110 cm) or W/H < – 3Z[a] or presence of bilateral oedema of the lower limbs.

Usual discharge (cure) criteria are: W/H > – 2 Z[a] and absence of bilateral oedema (2 consecutive assessments, one week apart) and absence of acute medical problems.

[a] Some national programmes define anthropometric admission and discharge criteria with reference to NCHS growth standards, with thresholds expressed in percentage of the median.

Medical management (hospitalisation or ambulatory care) is based on the presence or absence of associated serious complications:

– Children exhibiting anorexia, or significant medical complications, such as severe anaemia, severe dehydration or severe infection (complicated acute malnutrition) should be hospitalised[b].
– Children without significant medical complications (uncomplicated acute malnutrition) may undergo treatment on an ambulatory basis, with weekly medical follow-up.

Treatment

1) Nutritional treatment

Nutritional treatment is based on the use of therapeutic foods enriched with vitamins and minerals:

– Therapeutic milks (for use exclusively in hospitalised patients):
  • F-75 therapeutic milk, low in protein, sodium and calories (0.9 g of protein and 75 kcal per 100 ml) is used in the initial phase of treatment for patients suffering from complicated acute malnutrition. It is used to cover basic needs while complications are being treated. It is given in 8 daily meals.
  • F-100 therapeutic milk, in which the concentration of protein and calories is higher (2.9 g of protein and 100 kcal per 100 ml), replaces F-75 after several days, once the patient is stabilised (return of appetite, clinical improvement; disappearance or reduction of oedema). The objective is to facilitate rapid weight gain. It can be given with, or be replaced by, RUTF.
– RUTF (ready-to-use therapeutic food), i.e. foods which are ready for consumption (for example, peanut paste enriched with milk solids, such as Plumpy'nut®), are used in children treated in both hospital or ambulatory settings. The nutritional composition of RUTF is similar to F-100, but the iron content is higher. It is designed to promote rapid weight gain (approximately 500 kcal per 100 g). RUTF are the only therapeutic foods which can be used in ambulatory treatment.

Furthermore, it is important to give drinking water, in addition to meals, especially if the ambient temperature is high or the child has a fever.

Breastfeeding should continue in children of the appropriate age.

2) Routine medical treatment

In the absence of specific medical complications, the following routine treatments should be implemented in both ambulatory and hospital settings:

Infections

– Measles vaccination on admission.
– Broad spectrum antibiotic therapy starting on Day 1 (**amoxicillin** PO: 70 to 100 mg/kg/day in 2 divided doses for 5 days)[c].
– In endemic malaria areas: rapid test on D1, with treatment in accordance with results. If testing is not available, give malaria treatment (Malaria, Chapter 6).

[b] As a rule, any malnourished child presenting with medical complications should initially be hospitalised, even if s/he suffers from moderate, rather than severe, malnutrition (W/H > – 3Z).
[c] If specific signs of infection are present, the choice of treatment should be directed by the suspected focus.

– Treatment for intestinal worms on D8:
albendazole PO
Children > 6 months: 400 mg as a single dose (200 mg in children > 6 months but < 10 kg)

Micronutrient deficiencies

Therapeutic foods correct most of these deficiencies.

3) Management of common complications

Diarrhoea and dehydration

Diarrhoea is common in malnourished children. Therapeutic foods facilitate the recovery of gastrointestinal mucosa and restore the production of gastric acid, digestive enzymes and bile. Amoxicillin, administered as part of routine treatment, is effective in reducing bacterial load. Diarrhoea generally resolves without any additional treatment.

Watery diarrhoea is sometimes related to another pathology (otitis, pneumonia, malaria, etc.), which should be considered.

If an aetiological treatment is necessary, see Acute diarrhoea, Chapter 3.

If a child has a significant diarrhoea (very frequent or abundant stools) but is not dehydrated, administer specific oral rehydration solution (ReSoMal, see below), after each watery stool, to avoid dehydration, according to the WHO treatment Plan A (Appendix 2).

However, if the child has no profuse diarrhoea, give plain water (not ReSoMal) after each loose stool.

Dehydration is more difficult to assess in malnourished than healthy children (e.g., delay in return of skin pinch and sunken eyes are present even without dehydration in children with marasmus.).

The diagnosis is made on the basis of a history of watery diarrhoea of recent onset accompanied by weight loss, corresponding to fluid losses since the onset of diarrhoea. Chronic and persistent diarrhoea does not require rapid rehydration.

In the event of dehydration:

– *In there is no hypovolaemic shock*, rehydration is made by the oral route (if necessary using a nasogastric tube), with specific oral rehydration solution (ReSoMal)[d], containing less sodium and more potassium than standard solutions.
ReSoMal is administered under medical supervision (clinical evaluation and weight every hour). The dose is 20 ml/kg/hour for the first 2 hours, then 10 ml/kg/hour until the weight loss (known or estimated) has been corrected. Give ReSoMal after each watery stool according to the WHO treatment Plan A (Appendix 2).
In practice, it is useful to determine the target weight before starting rehydration. The target weight is the weight before the onset of diarrhoea. If the child is improving and showing no signs of fluid overload, rehydration is continued until the previous weight is attained.
If the weight loss cannot be measured (e.g. in newly admitted child), it can be estimated at 2 to 5% of the child's current weight. The target weight should not exceed 5% of the current weight (e.g., if the child weighs 5 kg before starting rehydration, the target weight should not exceed 5.250 kg). Regardless of the target weight, rehydration should be stopped if signs of fluid overload appear.

[d] Except for cholera, in which case standard oral rehydration solutions are used.

– *In case of hypovolaemic shock* (weak and rapid or absent radial pulse, cold extremities, CRT ≥ 3 seconds, whether or not consciousness is altered) in a child with diarrhoea or dehydration:
  - Place an IV line and administer 10 ml/kg of **0.9% sodium chloride** over 30 minutes, under close medical supervision.

  Simultaneously:
  - Start broad spectrum antibiotic therapy:
    ceftriaxone IV 100 mg/kg/day + **cloxacillin** IV 200 mg/kg/day
  - Administer oxygen (2 litres minimum).
  - Check blood glucose level or administer 5 ml/kg of 10% glucose by IV injection.
    Every 5 minutes, evaluate clinical response (recovery of consciousness, strong pulse, CTR < 3 seconds) and check for signs of over-hydration.
    - If the clinical condition has improved after 30 minutes, switch to the oral route with **ReSoMal**: 5 ml/kg every 30 minutes for 2 hours.
    - If the clinical condition has not improved, administer again 10 ml/kg of **0.9% sodium chloride** over 30 minutes then, when the clinical condition has improved, switch to the oral route as above.
      When switching to the oral route, stop the infusion but leave the catheter (capped) in place to keep a venous access, for IV antibiotic therapy.

Bacterial infections

Lower respiratory infections, otitis, skin and urinary infections are common, but sometimes difficult to identify (absence of fever and specific symptoms).
Infection should be suspected in a drowsy or apathetic child.
Severe infection should be suspected in the event of shock, hypothermia or hypoglycaemia.
Since the infectious focus may be difficult to determine, a broad spectrum antibiotic therapy (cloxacilline + ceftriaxone) is recommended.

Fever

Avoid antipyretics. If absolutely necessary, **paracetamol** PO:
10 mg/kg/dose, up to 3 times per day maximum
Do not wrap children in wet towels or cloths: not effective, increases disconfort, risk of hypothermia.

Hypothermia and hypoglycaemia

Hypothermia (rectal temperature < 35.5°C or axillary < 35°C) is a frequent cause of death in the first days of hospitalisation.
Prevention measures include keeping the child close to the mother ’s body (kangaroo method) and provision of blankets.
In case of hypothermia, warm the child as above, monitor the temperature, treat hypoglycaemia.
Severe infection should be suspected in the event of hypothermia (see above).

In hypoglycaemia, suspected or confirmed (test strip < 3.3 mmol/l or 60 mg/dl), administer glucose PO if the child is able to drink (50 ml of sugar water [50 ml water + a teaspoon of sugar] or 50 ml of milk); if the child is unconscious, 5 ml/kg of **10% glucose** IV, to be repeated once if necessary. Treat possible underlying infection.

Oral candidiasis

Look routinely for oral candidiadis as it interferes with feeding; see treatment Chapter 3, Stomatitis.

If the child fails to recover despite appropriate nutritional and medical treatment, consider another pathology: tuberculosis, HIV infection, etc.

Adolescents and adults

Clinical examination of the patient (sudden weight loss, loss of mobility from muscle wasting, cachexia, bilateral lower limb oedema in the absence of other causes of oedema) is indispensable for the diagnosis and adapted medical, nutritional and even social care of the patient.

Admission and discharge criteria, as a rough guide, are:

– Admission criteria:
  Adolescents: W/H according to NCHS-CDC-WHO 1982 reference table or bilateral lower limb oedema (Grade 3 or more, having excluded other causes of oedema).
  Adults: MUAC < 160 mm or bilateral lower limb oedema or MUAC < 185 mm in poor general condition (for example, inability to stand, evident dehydration).
  As in children, any malnourished patient presenting with significant complications should initially be hospitalised, regardless of the anthropometric criteria above.
– Discharge criteria:
  Adolescents: as in children.
  Adults: weight gain of 10-15% over admission weight and oedema below Grade 2 and good general condition.

Nutritional treatment follows the same principles as in children, but the calorie intake in relation to body weight is lower.

Routine treatment is similar to that in children, with the following exceptions:

– Measles vaccine is only administered to adolescents (up to age 15).
– Antibiotics are not routinely given, but infections should be considered, and treated or excluded, in the assessment of the patient.

Chapter 2: Respiratory diseases

Acute upper airway obstruction

Rhinitis and rhinopharyngitis (common cold)

Acute sinusitis

Acute pharyngitis

Diphtheria

Other upper respiratory tract infections
- *Laryngotracheitis and laryngotracheobronchitis (croup)*
- *Epiglottitis*
- *Bacterial tracheitis*

Otitis
- *Acute otitis externa*
- *Acute otitis media (AOM)*
- *Chronic suppurative otitis media (CSOM)*

Whooping cough (pertussis)

Bronchitis
- *Acute bronchitis*
- *Chronic bronchitis*

Bronchiolitis

Acute pneumonia
- *Pneumonia in children under 5 years of age*
- *Pneumonia in children over 5 years and adults*
- *Persistent pneumonia*

Staphylococcal pneumonia

Asthma
- *Asthma attack (acute asthma)*
- *Chronic asthma*

Pulmonary tuberculosis

Acute upper airway obstruction

Acute upper airway obstruction can be caused by foreign body aspiration, viral or bacterial infections (croup, epiglottitis, tracheitis), anaphylaxis, burns or trauma.
Initially stable and partial obstruction may worsen and develop into a life-threatening emergency, especially in young children.

Clinical features

Clinical signs of the severity of obstruction:

Obstruction	Signs	Danger signs
Complete	• Respiratory distress followed by cardiac arrest	Yes
Imminent complete	• Severe respiratory distress with cyanosis or saturation O_2 < 90% • Agitation or lethargy • Tachycardia, capillary refill time > 2 seconds	
Severe	• Stridor (abnormal high pitched sound on inspiration) at rest • Severe respiratory distress: – Severe intercostal and subcostal retractions – Nasal flaring – Substernal retractions (inward movement of the breastbone during inspiration) – Severe tachypnoea	
Moderate	• Stridor with agitation • Moderate respiratory distress: – Mild intercostal and subcostal retractions – Moderate tachypnoea	No
Mild	• Cough, hoarse voice, no respiratory distress	

Management in all cases

– Examine children in the position in which they are the most comfortable.
– Evaluate the severity of the obstruction according to the table above.
– Monitor oxygen saturation (SaO_2), except in mild obstruction.
– Administer oxygen (O_2), continuously:
  • to maintain the O_2 saturation between 94 and 98% if it is ≤ 90%[a] or if the patient has cyanosis or respiratory distress;
  • if pulse oxymeter is not available: at least 5 litres/minute or to relieve the hypoxia and improve respiration.
– Hospitalize (except if obstruction is mild), in intensive care if danger signs.
– Monitor mental status, heart and respiratory rate, SaO_2 and severity of obstruction.
– Maintain adequate hydration by mouth if possible, by IV if patient unable to drink.

[a] If possible it is better to treat all patients with a SaO_2 < 95% with oxygen.

Management of foreign body aspiration

Acute airway obstruction (the foreign body either completely obstructs the pharynx or acts as a valve on the laryngeal inlet), no warning signs, most frequently in a child 6 months to 5 years of age playing with a small object or eating. Conscience is initially maintained.

Perform maneuvers to relieve obstruction only if the patient cannot speak or cough or emit any sound:

– Children over 1 year and adults:
  Heimlich manoeuvre: stand behind the patient. Place a closed fist in the pit of the stomach, above the navel and below the ribs. Place the other hand over fist and press hard into the abdomen with a quick, upward thrust. Perform one to five abdominal thrusts in order to compress the lungs from the below and dislodge the foreign body.
– Children under 1 year:
  Place the infant face down across the forearm (resting the forearm on the leg) and support the infant's head with the hand. With the heel of the other hand, perform one to five slaps on the back, between shoulder plates.
  If unsuccessful, turn the infant on their back. Perform five forceful sternal compressions as in cardiopulmonary resuscitation: use 2 or 3 fingers in the center of the chest just below the nipples. Press down approximately one-third the depth of the chest (about 3 to 4 cm).

Repeat until the foreign body is expelled and the patient resumes spontaneous breathing (coughing, crying, talking). If the patient loses consciousness ventilate and perform cardiopulmonary rescucitation. Tracheostomy if unable to ventilate.

Differential diagnosis and management of airway obstructions of infectious origin

Infections	Symptoms	Appearance	Timing of symptoms
Viral croup	Stridor, cough and moderate respiratory difficulty	Prefers to sit	Progressive
Epiglottitis	Stridor, high fever and severe respiratory distress	Prefers to sit, drooling (cannot swallow their own saliva)	Rapid
Bacterial tracheitis	Stridor, fever, purulent secretions and severe respiratory distress	Prefers to lie flat	Progressive
Retropharyngeal or tonsillar abscess	Fever, sore throat and painful swallowing, earache, trismus and hot potato voice	Prefers to sit, drooling	Progressive

– Croup, epiglottitis, and tracheitis: see Other upper respiratory tract infections.
– Abscess: refer for surgical drainage.

Management of other causes

– Anaphylactic reaction (Quincke's oedema): see Anaphylactic shock (Chapter 1)
– Burns to the face or neck, smoke inhalation with airway oedema: see Burns (Chapter 10).

Rhinitis and rhinopharyngitis (common cold)

Rhinitis (inflammation of the nasal mucosa) and rhinopharyngitis (inflammation of the nasal and pharyngeal mucosa) are generally benign, self-limited and most often of viral origin. However, they may be an early sign of another infection (e.g. measles or influenza) or may be complicated by a bacterial infection (e.g. otitis media or sinusitis).

Clinical features

– Nasal discharge or obstruction, which may be accompanied by sore throat, fever, cough, lacrimation, and diarrhoea in infants. Purulent nasal discharge is not indicative of a secondary bacterial infection.
– In children under 5 years, routinely check the tympanic membranes to look for an associated otitis media.

Treatment

– Antibiotic treatment is not recommended: it does not promote recovery nor prevent complications.
– Treatment is symptomatic:
  • Clear the nose with 0.9% sodium chloride[a].
  • Fever, throat soreness: paracetamol PO for 2 to 3 days (Fever, Chapter 1).

[a] For a child: place him on his back, head turned to the side, and instil 0.9% sodium chloride into each nostril.

Acute sinusitis

Acute sinusitis is an inflammation of one or more of the sinus cavities, caused by an infection or allergy.
Most acute sinus infections are viral and resolve spontaneously in less than 10 days. Treatment is symptomatic.
Acute bacterial sinusitis may be a primary infection, a complication of viral sinusitis or of dental origin. The principal causative organisms are *Streptococcus pneumoniae*, *Haemophilus influenzae* and *Staphylococcus aureus*.
It is essential to distinguish between bacterial sinusitis and common rhinopharyngitis (see Rhinitis and rhinopharyngitis). Antibiotic therapy is required in case of bacterial sinusitis only.
Without treatment, severe sinusitis in children may cause serious complications due to the spread of infection to the neighbouring bony structures, orbits or the meninges.

Clinical features

Sinusitis in adults

– Purulent unilateral or bilateral discharge, nasal obstruction
and
– Facial unilateral or bilateral pain that increases when bending over; painful pressure in maxillary area or behind the forehead.
– Fever is usually mild or absent.

Sinusitis is likely if symptoms persist for longer than 10 to 14 days or worsen after 5 to 7 days or are severe (severe pain, high fever, deterioration of the general condition).

Sinusitis in children

– Same symptoms; in addition, irritability or lethargy or cough or vomiting may be present.
– In the event of severe infection: deterioration of the general condition, fever over 39°C, periorbital or facial oedema.

Treatment

Symptomatic treatment

– Fever and pain (Chapter 1).
– Clear the nose with 0.9% sodium chloride[a].

Antibiotic therapy

– In adults:
  Antibiotic therapy is indicated if the patient meets the criteria of duration or severity of symptoms. Oral amoxicillin is the first-line treatment.
  If the diagnosis is uncertain (moderate symptoms < 10 days) and the patient can be re-examined in the next few days, start with a symptomatic treatment, as for rhinopharyngitis or viral sinusitis.

[a] For a child: place him on his back, head turned to the side, and instil 0.9% sodium chloride into each nostril.

– In children:
  Antibiotic therapy is indicated if the child has severe symptoms or mild symptoms associated with risk factors (e.g. immunosuppression, sickle cell disease, asthma). Oral amoxicillin is the first-line treatment.
  amoxicillin PO for 7 to 10 days:
  Children: 80 to 100 mg/kg/day in 3 divided doses
  Adults: 3 g/day in 3 divided doses

  In the event of failure to respond within 48 hours of therapy:
  amoxicillin/clavulanic acid PO for 7 to 10 days (the dose is expressed in amoxicillin):

  Children < 40 kg: 45 to 50 mg/kg/day in 2 divided doses (if using ratio 8:1 or 7:1) or in 3 divided doses (if using ratio 4:1)
  The dose of clavulanic acid should not exceed 12.5 mg/kg/day or 375 mg/day.

  Children ≥ 40 kg and adults: 1500 to 2000 mg/day depending on the formulation available:
  Ratio 8:1: 2000 mg/day = 2 tablets of 500/62.5 mg 2 times per day
  Ratio 7:1: 1750 mg/day = 1 tablet of 875/125 mg 2 times per day
  Ratio 4:1: 1500 mg/day = 1 tablet of 500/125 mg 3 times per day
  The dose of clavulanic acid should not exceed 375 mg/day.

  In penicillin-allergic patients:
  erythromycin PO for 7 to 10 days:
  Children: 30 to 50 mg/kg/day in 2 to 3 divided doses
  Adults: 2 to 3 g/day in 2 to 3 divided doses

– In infants with ethmoiditis, see Periorbital and orbital cellulitis (Chapter 5).

Other treatments

– For sinusitis secondary to dental infection: dental extraction while under antibiotic treatment.
– In the event of ophthalmologic complications (ophthalmoplegia, mydriasis, reduced visual acuity, corneal anesthesia), refer for surgical drainage.

Acute pharyngitis

– Acute inflammation of the tonsils and pharynx. The majority of cases are of viral origin and do not require antibiotic treatment. Group A streptococcus is the main bacterial cause, and mainly affects children age 3 to 14 years.
– Acute rheumatic fever, a serious late complication of Group A streptococcal pharyngitis (GAS), can be prevented with antibiotic therapy.
– One of the main objectives in assessing acute pharyngitis is to identify patients requiring antibiotic treatment.

Clinical features

– Features common to all types of pharyngitis: throat pain and dysphagia (difficulty swallowing), with or without fever.

– Specific features, depending on the cause:

  Common forms:

  • *Erythematous* (red throat) or *exudative* (red throat and whitish exudate) pharyngitis: since this appearance is common to both viral and GAS pharyngitis, a clinical score that allows identification of children at high risk for GAS should be used. The Joachim score diminishes empiric antibiotic use in settings where rapid testing for GAS is not available.

Joachim score

Age	≤ 35 months		1
	36 to 59 months		2
	≥ 60 months		3
Bacterial signs		One point for each	Total number of bacterial signs
	Tender cervical node		
	Headache		
	Petechiae on the palate		
	Abdominal pain		
	Sudden onset (< 12 hours)		
Take age value (1, 2 or 3) and add it to the number of bacterial signs above			=
Viral signs		One point for each	Total number of viral signs
	Conjunctivitis		
	Coryza (runny nose)		
	Diarrhoea		
Subtract the number of viral signs to obtain the **score**			=

In patients over 14 years, the probability of GAS pharyngitis is low. Infectious mononucleosis (IM) due to the Epstein-Barr virus should be suspected in adolescents and young adults with extreme fatigue, generalized adenopathy and often splenomegaly.

Erythematous or exudative pharyngitis may also be associated with gonococcal or primary HIV infection. In these cases, the diagnosis is mainly prompted by the patient's history.

- *Pseudomembranous pharyngitis* (red tonsils/pharynx covered with an adherent greyish white false membrane): see Diphtheria.

Less common forms:

- *Vesicular pharyngitis* (clusters of tiny blisters or ulcers on the tonsils): always viral (coxsackie virus or primary herpetic infection).
- *Ulcero-necrotic pharyngitis*: hard and painless syphilitic chancre of the tonsil; tonsillar ulcer soft on palpation in a patient with poor oral hygiene and malodorous breath (Vincent tonsillitis).

– Local complications:
Peritonsillar abscess: fever, intense pain, hoarse voice, trismus (limitation of mouth opening), unilateral deviation of the uvula.

Treatment

– In all cases: paracetamol PO, see Fever, Chapter 1.

– Joachim score is ≤ 2: viral pharyngitis, which typically resolves within a few days (or weeks, for IM): no antibiotic therapy.

– Joachim score is ≥ 3: administer antibiotic therapy for GAS pharyngitis:

- If single-use injection equipment is available, benzathine benzylpenicillin is the drug of choice as streptococcus A resistance to penicillin remains rare; it is the only antibiotic proven effective in reducing the incidence of rheumatic fever; and the treatment is administered as a single dose.
benzathine benzylpenicillin IM
Children under 30 kg (or under 10 years): 600 000 IU as a single dose
Children 30 kg and over (or 10 years and over) and adults: 1.2 MIU as a single dose
- Penicillin V is the oral reference treatment, but poor adherence is predictable due to the length of treatment.
phenoxymethylpenicillin (**penicillin V**) PO for 10 days
Children under 1 year: 250 mg/day in 2 divided doses
Children from 1 to 5 years: 500 mg/day in 2 divided doses
Children from 6 to 12 years: 1 g/day in 2 divided doses
Adults: 2 g/day in 2 divided doses
- Amoxicillin is an alternative and the treatment has the advantage of being relatively short. However, it can cause adverse skin reactions in patients with undiagnosed IM and thus should be avoided when IM has not been excluded.
amoxicillin PO for 6 days
Children: 50 mg/kg/day in 2 divided doses
Adults: 2 g/day in 2 divided doses

- Macrolides should be reserved for penicillin allergic patients as resistance to macrolides is frequent and their efficacy in the prevention of rheumatic fever has not been studied. Poor adherence with erythromycin is predictable due to the length of treatment. Azithromycin treatment has the advantage of being short.
  erythromycin PO for 10 days
  Children: 30 to 50 mg/kg/day in 2 to 3 divided doses
  Adults: 2 to 3 g/day in 2 to 3 divided doses
  or
  azithromycin PO for 3 days
  Children: 20 mg/kg once daily without exceeding 500 mg/day
  Adults: 500 mg once daily

– Gonococcal or syphilitic pharyngitis: as for genital gonorrhoea (Chapter 9, page 252) and syphilis (Chapter 9, page 257).

– Diphtherial pharyngitis: see Diphtheria.

– Vincent tonsillitis: penicillin V or erythromycin as above.

– Peritonsillar abscess: refer for surgical drainage.

Diphtheria

– Bacterial infection due to *Corynebacterium diphtheriae*, characterized by proliferation of the bacteria in the upper respiratory tract and systemic diffusion of the diphtheria toxin through the body.
– The infection is spread by droplets (coughing, sneezing, speaking) from the upper respiratory tract of a patient or carrier.
– The disease does not confer sufficient immunity. Immunisation protects against the effects of the toxin but does not prevent individuals from becoming carriers.

Clinical features

– Incubation period: 2 to 5 days.
– Signs related to the infection:
  • Pseudomembranous tonsillitis (grey, tough and very sticky membranes) with dysphagia and cervical adenitis, at times progressing to massive swelling of the neck;
  • Airway obstruction and possible suffocation when the infection extends to the nasal passages, the larynx, the trachea and the bronchi;
  • Fever is generally low-grade.
– Generalised signs due to the toxin, they determine the prognosis:
  • Cardiac dysfunction (gallop on auscultation, arrhythmias), myocarditis with severe heart failure at times leading to cardiogenic shock;
  • Neuropathies 1 to 3 months after the onset of the disease leading to difficulty with: swallowing (paralysis of the soft palate), vision (ocular motor paralysis), breathing (paralysis of respiratory muscles) and ambulation (limb paralysis);
  • Oliguria, anuria and renal failure.

Laboratory

Confirmation is made by culturing a toxigenic strain of *C. diphtheriae* from a throat swab.

Management of cases (in hospital)

– Careful examination of the throat.

– Strict isolation of patients; contact and droplet precautions for medical staff (gloves, gown, masks and handwashing).

– Administration of **diphtheria antitoxin** derived from horse serum. Do not wait for bacteriological confirmation any delay can diminish efficacy. Administer according to the Besredka method to assess possibility of allergy.

⚠
  • Risk of an anaphylactic reaction, especially in patients with asthma. Close monitoring of the patient is essential, with immediate availability of equipment for manual ventilation (Ambu bag, face mask) and intubation, Ringer lactate and epinephrine.
  • Besredka method: inject 0.1 ml SC and wait 15 minutes. If there is no allergic reaction (no erythema at the injection site or a flat erythema of less than 0.5 in diameter, inject a further 0.25 ml SC. If there is no reaction after 15 minutes, inject the rest of the product IM or IV depending on the volume to be administered.

Doses are given as a function of the severity of illness, and the delay in treatment:

Cllinical signs	Dose in units	Administration route
Laryngitis or pharyngitis or duration < 48 hours	20 to 40 000	IM or IV infusion in 250 ml of 0.9% sodium chloride in 2 to 4 hours for doses of more than 20 000 UI.
Rhinopharyngitis	40 to 60 000	
Severe form, cervical oedema or duration ≥ 48 hours	80 to 100 000	

– Antibiotic treatment for 14 days (or according to length of treatment recommended by the national protocol):

- If the patient can swallow:
  azithromycin PO
  Children: 20 mg/kg once daily (max. 500 mg/day)
  Adults: 500 mg once daily
  or
  erythromycin PO
  Children: 50 mg/kg/day in 2 divided doses (max. 2 g/day)
  Adults: 2 g/day in 2 divided doses
  or
  phenoxymethylpenicillin (**penicillin V**) PO
  Children under 1 year: 50 mg/kg/day in 4 divided doses (max. 500 mg/day)
  Children from 1 to 6 years: 500 mg/day in 4 divided doses
  Children over 6 years and adults: 1 g/day in 4 divided doses
- If the patient cannot swallow:
  benzylpenicillin IM or slow IV (3 minutes)
  Children: 100 000 to 150 000 IU (60 to 90 mg)/kg/day in 4 divided doses (max. 4 MIU (2.4 g)/day)
  Adults: 4 MIU (2.4 g)/day in 4 divided doses
  In penicillin-allergic patients, use erythromycin IV[a].
  As soon as the patient can drink, change to the oral route with one of the oral treatments above, to complete 14 days of treatment.

– Urgent intervention to secure an airway (intubation, tracheotomy) may be necessary in the event of laryngeal obstruction, cardiac or neurologic complications.

Management of close contacts

Close contacts include family members living under the same roof and people who were directly exposed to nasopharyngeal secretions of the patient on a regular basis (e.g. children in the same class, medical personnel).

– Throat culture; temperature and throat examination daily (7 days); exclusion from school or work until 48 hours of antibiotics have been completed.

[a] **Erythromycin** IV infusion (60 minutes)
Children: 50 mg/kg/day in 4 divided doses (max. 2 g/day); adults: 2 g/day in 4 divided doses
Erythromycin powder (1 g) should be reconstituted in 20 ml of water for injection only. Then, dilute each dose of erythromycin in 10 ml/kg of 0.9% sodium chloride in children less than 20 kg and in a bag of 250 ml of 0.9% sodium chloride in children over 20 kg and in adults. Do not dilute in glucose.

– Antibiotic treatment:
  • **benzathine benzylpenicillin** IM
    Children under 30 kg (or under 10 years): 600 000 IU as a single dose
    Children 30 kg and over (or 10 years and over) and adults: 1.2 MIU as a single dose
    ⚠ Benzathine benzylpenicillin should NEVER be administered by IV route.
  • In penicillin-allergic patients, use azithromycin or erythromycin PO as above for 7 days.
– Verify vaccination status:
  • Less than 3 injections: complete with DTP, DT or Td according to age;
  • 3 injections: if the last injection was given more than one year before, give a booster dose.
– Medical personnel in direct contact with patients: one dose of Td (booster).

Prevention

– Once the patient has recovered update their immunisations.
– Routine vaccination (EPI), for information: DTP: 3 doses at one month intervals before the age of 1 year, DTP booster one year later, and DT (diphtheria 30 IU/tetanus) at 6 years of age followed by 3 more Td (diphtheria 3 IU/tetanus) boosters at 10 year intervals.
– Mass vaccination (epidemic): update routine immunisations with DTP for children under 3 years of age; DT for children from 3 to 6 years of age; Td for children over 7 years of age and adults.

Other upper respiratory tract infections

Laryngotracheitis and laryngotracheobronchitis (croup)

Viral infection in children aged 3 months to 4 years.

Clinical features

– Typical barking cough, hoarse voice or cry.
– Inspiratory stridor (abnormal high pitched sound on inspiration):
  • Croup is considered mild or moderate if the stridor only occurs with agitation;
  • Croup is considered severe if there is stridor at rest, especially when it is accompanied by respiratory distress.
– Wheezing may also be present if the bronchi are involved.

Treatment

– In the absence of inspiratory stridor or retractions, treat symptomatically: ensure adequate hydration, seek medical attention if symptoms worsen (e.g. respiratory difficulty, noisy breathing and inability to tolerate oral fluids).
– If stridor is only present with agitation (moderate croup):
  • Hospitalize for treatment and observation (risk of worsening).
  • Assure adequate hydration.
  • **dexamethasone**[a] PO (use IV preparation flavoured with sugar water, 10% or 50% glucose or juice) or IM if child is vomiting: 0.6 mg/kg as a single dose (see table on the next page).
– If danger signs are present (stridor at rest, respiratory distress), hospitalize in intensive care:
  • Oxygen continuously: at least 5 litres/minute or to maintain the O_2 saturation between 94 and 98%.
  • Insert a peripheral IV line and provide IV hydration.
  • **epinephrine** (**adrenaline**) via nebulizer (1 mg/ml, 1 ml ampoule): 0.5 mg/kg (max. 5 mg) repeat every 20 minutes if danger signs persist.
    Monitor heart rate during nebulization (if heart rate greater than 200, stop the nebulization).

Age	3 months	4-6 months	7-9 months	10-11 months	1-4 years
Weight	**6 kg**	**7 kg**	**8 kg**	**9 kg**	**10-17 kg**
Dose in mg	3 mg	3.5 mg	4 mg	4.5 mg	5 mg
Dose in ml	3 ml	3.5 ml	4 ml	4.5 ml	5 ml
NaCl 0.9%*	1 ml	1 ml	–	–	–

* Add sufficient NaCl 0.9% to obtain a total volume of 4 to 4.5 ml in the nebulizing chamber.

⚠ Epinephrine is intended exclusively for nebulized administration and should not be given IV or IM in croup.

[a] Administer orally if possible in order to avoid causing agitation in the child as this may worsen symptoms.

- **dexamethasone**[b] (4 mg/ml, 1 ml ampoule) IM or IV: 0.6 mg/kg single dose

Age	3-11 months	1-2 years	3-4 years
Weight	**6-9 kg**	**10-13 kg**	**14-17 kg**
Dose in mg	4 mg	8 mg	10 mg
Dose in ml	1 ml	2 ml	2.5 ml

Suspect bacterial tracheitis in a critically ill appearing child[c] with croup who does not improve with the above treatment.

– If wheezing is present:
salbutamol aerosol (using a spacer): 2 to 3 puffs every 20 to 30 minutes as needed

– If the patient has a complete airway obstruction, intubation if possible or emergency tracheotomy.

Epiglottitis

Bacterial infection of the epiglottis in young children caused by *Haemophilus influenzae*, it is rare when Hib vaccine coverage is high. It can be caused by other bacteria and occur in adults.

Clinical features

– Rapid (less than 12-24 hours) onset of high fever.
– Typical "tripod or sniffing" position, preferring to sit, leaning forward with an open mouth, anxious appearing.
– Difficulty swallowing, drooling, and respiratory distress.
– Stridor may be present (as opposed to croup, hoarse voice and cough are usually absent).
– Critically ill appearing[c].

⚠ Allow the child to sit in a comfortable position or on the parent's lap. Do not force them to lie down (may precipitate airway obstruction). Avoid any examination that will upset the child including examination of the mouth and throat.

Treatment

– In case of imminent airway obstruction, emergency intubation or tracheotomy is indicated. The intubation is technically difficult and should be performed under anaesthesia by a physician familiar with the procedure. Be prepared to perform a tracheotomy if intubation is unsuccessful.

– In all cases:
  • Insert a peripheral IV line and provide intravenous hydration.

[b] Administer orally if possible in order to avoid causing agitation in the child as this may worsen symptoms.

[c] Critically ill appearing child: weak grunting or crying, drowsiness, difficult to arrouse, does not smile, unconjugate or anxious gaze, pallor or cyanosis, general hypotonia.

- Antibiotic therapy:
  ceftriaxone slow IV[d] (3 minutes) or IV infusion (30 minutes). Avoid IM (may agitate the child and precipitate a respiratory arrest).
  Children: 50 mg/kg once daily
  Adults: 1 g once daily
  The IV treatment is administered for at least 5 days then, if the clinical condition has improved[e] and oral treatment can be tolerated, change to:
  amoxicillin/clavulanic acid (**co-amoxiclav**) PO to complete a total of 7 to 10 days of treatment. The dose is expressed in amoxicillin:
  Children < 40 kg: 80 to 100 mg/kg/day in 2 or 3 divided doses (use formulations in a ratio of 8:1 or 7:1 exclusively)[f].
  Children ≥ 40 kg and adults:
  Ratio 8:1: 3000 mg/day (= 2 tablets of 500/62.5 mg 3 times per day)
  Ratio 7:1: 2625 mg/day (= 1 tablet of 875/125 mg 3 times per day)
  The dose of clavulanic acid should not exceed 12.5 mg/kg/day or 375 mg/day.

Bacterial tracheitis

Bacterial infection of the trachea in children, occurring as a complication of a previous viral infection (croup, influenza, measles, etc.).

Clinical features

– Fever in a critically ill appearing child[g].
– Stridor, cough and respiratory distress.
– Copious purulent secretions.
– As opposed to epiglottitis the onset of symptoms is gradual and the child prefers to lie flat.
– In severe cases there is a risk of complete airway obstruction, especially in very young children.

Treatment

– Suction purulent secretions.
– Insert a peripheral IV line and provide IV hydration.
– Antibiotic therapy:
  ceftriaxone slow IV[d] (3 minutes) or IV infusion (30 minutes), avoid IM (may agitate the child and precipitate a respiratory arrest).
  Children: 50 mg/kg once daily
  Adults: 1 g once daily

[d] For administration by IV route, ceftriaxone powder should to be reconstituted in water for injection only. For administration by IV infusion, dilute each dose of ceftriaxone in 5 ml/kg of 0.9% sodium chloride or 5% glucose in children less than 20 kg and in a bag of 100 ml of 0.9% sodium chloride or 5% glucose in children over 20 kg and in adults.

[e] Improvement criteria include: fever reduction, diminished respiratory distress, improved O_2 saturation, improved appetite and/or activity.

[f] If the only formulation of co-amoxiclav available is 4:1, the dose is 50 mg/kg/day.

[g] Critically ill appearing child: weak grunting or crying, drowsiness, difficult to arrouse, does not smile, unconjugate or anxious gaze, pallor or cyanosis, general hypotonia.

+
cloxacillin IV infusion (60 minutes)
Children less than 12 years: 100 to 200 mg/kg/day in 4 divided doses
Children over 12 years and adults: 8 to 12 g/day in 4 divided doses
The IV treatment is administered for at least 5 days then, if the clinical condition has improved[h] and oral treatment can be tolerated, change to :
amoxicillin/clavulanic acid (**co-amoxiclav**) PO to complete 7 to 10 days of treatment, as in epiglottitis.

– If the patient has a complete airway obstruction, intubation if possible or emergency tracheotomy.

[h] Improvement criteria include: fever reduction, diminished respiratory distress, improved O_2 saturation, improved appetite and/or activity.

Otitis

Acute otitis externa

Diffuse inflammation of the external ear canal, due to bacterial or fungal infection. Common precipitants of otitis externa are maceration, trauma of the ear canal or presence of a foreign body or dermatologic diseases (such as eczema, psoriasis).

Clinical features

– Ear canal pruritus or ear pain, often severe and exacerbated by motion of the pinna; feeling of fullness in the ear; clear or purulent ear discharge or no discharge
– Otoscopy:
  • diffuse erythema and edema, or infected eczema, of the ear canal
  • look for a foreign body
  • if visible, the tympanic membrane is normal (swelling, pain or secretions very often prevent adequate visualization of the tympanic membrane)

Treatment

– Remove a foreign body, if present.
– Treatment of pain: paracetamol and/or ibuprofen PO (Chapter 1, Pain, page 31).
– Local treatment (usually 5 to 7 days):
  Remove skin debris and secretions from the auditory canal by gentle dry mopping (use a dry cotton bud or a small piece of dry cotton wool). In addition, 0.5% gentian violet can be applied once a day, using a cotton bud.
  Consider ear irrigation (0.9% sodium chloride, using a syringe) only if the tympanic membrane can be fully visualised and is intact (no perforation). Otherwise, ear irrigation is contra-indicated.

Acute otitis media (AOM)

Acute inflammation of the middle ear, due to viral or bacterial infection, very common in children under 3 years, but uncommon in adults.
The principal causative organisms of bacterial otitis media are *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Moraxella catarrhalis* and in older children, *Streptococcus pyogenes*.

Clinical features

– Rapid onset of ear pain (in infants: crying, irritability, sleeplessness, reluctance to nurse) and ear discharge (otorrhoea) or fever.
– Other signs such as rhinorrhoea, cough, diarrhoea or vomiting are frequently associated, and may confuse the diagnosis, hence the necessity of examining the tympanic membranes.
– Otoscopy: bright red tympanic membrane (or yellowish if rupture is imminent) and presence of pus, either externalised (drainage in ear canal if the tympanic membrane is ruptured) or internalised (opaque or bulging tympanic membrane). The combination of these signs with ear pain or fever confirms the diagnosis of AOM.

Note:
The following otoscopic findings are not sufficient to make the diagnosis of AOM:
- A red tympanic membrane alone, with no evidence of bulging or perforation, is suggestive of viral otitis in a context of upper respiratory tract infection, or may be due to prolonged crying in children or high fever.
- The presence of air bubbles or fluid behind an intact tympanic membrane, in the absence of signs and symptoms of acute infection, is suggestive of otitis media with effusion (OME).

– Complications, particularly in high-risk children (malnutrition, immunodeficiency, ear malformation) include chronic suppurative otitis media, and rarely, mastoiditis, brain abscess or meningitis.

Treatment

– In all cases:
- Treatment of fever and pain: paracetamol PO (Chapter 1).
- Ear irrigation is contra-indicated if the tympanic membrane is ruptured, or when the tympanic membrane cannot be fully visualised. Ear drops are not indicated.

– Indications for antibiotic therapy:
- Antibiotics are prescribed in children less than 2 years, children whose assessment suggests severe infection (vomiting, fever > 39°C, severe pain) and children at risk of unfavourable outcome (malnutrition, immunodeficiency, ear malformation).
- For other children:
  1) If the child can be re-examined within 48 to 72 hours: it is preferable to delay antibiotic prescription. Spontaneous resolution is probable and a short symptomatic treatment of fever and pain may be sufficient. Antibiotics are prescribed if there is no improvement or worsening of symptoms after 48 to 72 hours.
  2) If the child cannot be re-examined: antibiotics are prescribed.
- For children treated with antibiotics: advise the mother to bring the child back if fever and pain persist after 48 hours.

– Choice of antibiotic therapy:
- Amoxicillin is the first-line treatment:
  amoxicillin PO
  Children: 80 to 100 mg/kg/day in 3 divided doses for 5 days
  Adults: 3 g/day in 3 divided doses for 5 days
- Amoxicillin/clavulanic acid is used as second-line treatment, in the case of treatment failure. Treatment failure is defined as persistence of fever and/or ear pain after 48 hours of antibiotic treatment.
  amoxicillin/clavulanic acid (**co-amoxiclav**) PO for 5 days
  The dose is expressed in amoxicillin:

  Children < 40 kg: 45 to 50 mg/kg/day in 2 divided doses (if using ratio 8:1 or 7:1) or in 3 divided doses (if using ratio 4:1)
  The dose of clavulanic acid should not exceed 12.5 mg/kg/day or 375 mg/day.

  Children ≥ 40 kg and adults: 1500 to 2000 mg/day depending on the formulation available:
  Ratio 8:1: 2000 mg/day = 2 tablets of 500/62.5 mg 2 times per day
  Ratio 7:1: 1750 mg/day = 1 tablet of 875/125 mg 2 times per day
  Ratio 4:1: 1500 mg/day = 1 tablet of 500/125 mg 3 times per day
  The dose of clavulanic acid should not exceed 375 mg/day

Persistence of a ear drainage alone, without fever and pain, in a child who has otherwise improved (reduction in systemic symptoms and local inflammation) does not warrant a change in antibiotic therapy. Clean ear canal by gentle dry mopping until no more drainage is obtained.

- Azithromycin or erythromycin should be reserved for very rare penicillin-allergic patients, as treatment failure (resistance to macrolides) is frequent.
  azithromycin PO
  Children over 6 months: 10 mg/kg once daily for 3 days
  erythromycin PO
  30 to 50 mg/kg/day in 2 to 3 divided doses for 10 days

Chronic suppurative otitis media (CSOM)

Chronic bacterial infection of the middle ear with persistent purulent discharge through a perforated tympanic membrane.
The principal causative organisms are *Pseudomonas aeruginosa*, *Proteus* spp, staphylococcus, other Gram negatives and anaerobes.

Clinical features

– Purulent discharge for more than 2 weeks, often associated with hearing loss or even deafness; absence of pain and fever

– Otoscopy: perforation of the tympanic membrane and purulent exudate

– Complications:
  - Consider a superinfection (AOM) in the case of new onset of fever with ear pain, and treat accordingly.
  - Consider mastoiditis in the case of new onset of high fever, severe ear pain and/or tender swelling behind the ear, in a patient who appears significantly unwell.
  - Consider brain abscess or meningitis in the case of impaired consciousness, neck stiffness and focal neurological signs (e.g. facial nerve paralysis).

Treatment

– Remove secretions from the auditory canal by gentle dry mopping (use a dry cotton bud or a small piece of dry cotton wool) then apply **ciprofloxacin** (ear drops): 2 drops twice daily, until no more drainage is obtained (max. 4 weeks).

– Complications:
  - Chronic mastoiditis is a medical emergency that requires prompt hospitalisation, prolonged antibiotic treatment that covers the causative organisms of CSOM (**ceftriaxone** IM 10 days + **ciprofloxacin** PO for 14 days), atraumatic cleaning of the ear canal; surgical treatment may be required. Before transfer to hospital, if the patient needs to be transferred, administer the first dose of antibiotics.
  - Meningitis (Chapter 7).

Whooping cough (pertussis)

Whooping cough is a highly contagious bacterial infection of the lower respiratory tract, of prolonged duration, due to *Bordetella pertussis*.
B. pertussis is transmitted through inhalation of droplets spread by infected individuals (coughing, sneezing).
The majority of cases arise in non-vaccinated or incompletely vaccinated individuals. Whooping cough affects all age groups. Signs and symptoms are usually minor in adolescents and adults. As a result the infection may be ignored, thus contributing to the spread of *B. pertussis* and infection in infants and young children, in whom the illness is severe.

Clinical features

After an incubation period of 7 to 10 days, the illness evolves in 3 phases:

– Catarrhal phase (1 to 2 weeks): coryza and cough. At this stage, the illness is indistinguishable from a minor upper respiratory infection.

– Paroxysmal phase (1 to 6 weeks):
  • Typical presentation: cough of at least 2 weeks duration, occurring in characteristic bouts (paroxysms), followed by a laboured inspiration causing a distinctive sound (whoop), or vomiting. Fever is absent or moderate, and the clinical exam is normal between coughing bouts; however, the patient becomes more and more fatigued.
  • Atypical presentations:
    - Infants under 6 months: paroxysms are poorly tolerated, with apnoea, cyanosis; coughing bouts and whoop may be absent.
    - Adults: prolonged cough, often without other symptoms.
  • Complications:
    - Major: in infants, secondary bacterial pneumonia (new-onset fever is an indicator); malnutrition and dehydration triggered by poor feeding due to cough and vomiting; rarely, seizures, encephalopathy; sudden death.
    - Minor: subconjunctival haemorrhage, petechiae, hernias, rectal prolapse.

– Convalescent phase: symptoms gradually resolve over weeks or months.

Management and treatment

Suspect cases

– Routinely hospitalise infants less than 3 months, as well as children with severe cases. Infants under 3 months must be monitored 24 hours per day due to the risk of apnoea.

– When children are treated as outpatients, educate the parents about signs that should lead to re-consultation (fever, deterioration in general condition, dehydration, malutrition, apnoea, cyanosis).

– Respiratory isolation (until the patient has received 5 days of antibiotic treatment):
  • at home: avoid contact with non-vaccinated or incompletely vaccinated infants;
  • in congregate settings: exclusion of suspect cases;
  • in hospital: single room or grouping together of cases away from other patients (cohorting).

– Hydration and nutrition: ensure children < 5 years are well hydrated; breastfeeding should continue. Advise mothers to feed the child frequently in small quantities after coughing bouts and the vomiting which follows. Monitor the weight of the child during the course of the illness, and consider food supplements for several weeks after recovery.
– Antibiotic therapy:
  Antibiotic treatment is indicated in the first 3 weeks after onset of cough. Infectivity is virtually nil after 5 days of antibiotic treatment.

	Antibiotic	Children	Adults
First line	**azithromycin** PO once daily, for 5 days	10 mg/kg/day (max. 500 mg/day)	D1 500 mg D2-D5 250 mg/day
Alternatives	**erythromycin** PO in 3 divided doses/day, for 7 days	50 mg/kg/day (avoid in infant < 1 month of age)	1 g/day
	cotrimoxazole PO in 2 divided doses/day, for 14 days	40 mg/kg/day SMX + 8 mg/kg/day TMP (avoid in infant < 1 month of age, and last month of pregnancy)	1600 mg/day SMX + 320 mg/day TMP

– For hospitalised children:
  • Place the child in a semi-reclining position (± 30°).
  • Oro-pharyngeal suction if needed.

Post-exposure prophylaxis

– Antibiotic prophylaxis (same treatment as for suspect cases) is recommended for unvaccinated or incompletely vaccinated infants of less than 6 months, who have had contact with a suspect case.
– Isolation of contacts is not necessary.

Note: pertussis vaccination should be updated in all cases (suspects and contacts). If the primary series has been interrupted, it should be completed, rather than restarted from the beginning.

Prevention

Routine vaccination with polyvalent vaccines containing pertussis antigens (e.g. DTP, or DTP + Hep B, or DTP + Hib + Hep B) from the age of 6 weeks or according to national protocol.
Neither vaccination nor natural disease confers lasting immunity. Booster doses are necessary to reinforce immunity and reduce the risk of developing disease and transmitting it to young children.

Bronchitis

Acute bronchitis

An acute inflammation of the bronchial mucosa, most commonly of viral origin. In older children it can be caused by *Mycoplasma pneumoniae*. In children over 2 years of age with repetitive acute bronchitis or 'wheezing' bronchitis, consider asthma (see Asthma). In children under 2 years of age, consider bronchiolitis (see Bronchiolitis).

Clinical features

Often begins with a rhinopharyngitis that descends progressively: pharyngitis, laryngitis, tracheitis.
- Heavy cough, dry at the beginning then becoming productive
- Low-grade fever
- No tachypnoea, no dyspnoea
- On pulmonary auscultation: bronchial wheezing

Treatment

- Fever: paracetamol PO (Chapter 1).
- Keep the patient hydrated, humidify air (with a bowl of water or a wet towel).
- Children: nasal irrigation with 0.9% sodium chloride or Ringer Lactate, 4 to 6 times/day to clear the airway.
- Antibiotic treatment is not useful for patients in good overall condition with rhinopharyngitis or influenza.
- Antibiotic treatment is indicated only if:
  - the patient is in poor general condition: malnutrition, measles, rickets, severe anaemia, cardiac disease, elderly patient etc.
  - if the patient has dyspnoea, fever greater than 38.5°C and purulent expectorations: a secondary infection with Haemophilus influenzae or with pneumococcus is probable.
    amoxicillin PO
    Children: 100 mg/kg/day in 3 divided doses for 5 days
    Adults: 3 g/day in 3 divided doses for 5 days

Chronic bronchitis

A chronic inflammation of the bronchial mucosa due to irritation (tobacco, pollution), allergy (asthma) or infection (repetitive acute bronchitis). It may develop into chronic obstructive pulmonary disease.

Clinical features

- Productive cough for 3 consecutive months per year for 2 successive years.
- No dyspnoea at onset. Dyspnoea develops after several years, first on exertion, then becoming persistent.
- On pulmonary auscultation: bronchial wheeze (always exclude tuberculosis).

A patient with an acute exacerbation of chronic bronchitis presents with:
– Onset or increase of dyspnoea.
– Increased volume of sputum.
– Purulent sputum.

Treatment

– Antibiotic treatment is not useful in treating simple chronic bronchitis.
– Antibiotic treatment may be useful, for patients in a poor general condition only, for acute exacerbations of chronic bronchitis (see Acute bronchitis).
– Discourage smoking and other irritating factors.

Bronchiolitis

Bronchiolitis is an epidemic and seasonal viral infection of the lower respiratory tract in children less than 2 years of age, characterised by bronchiolar obstruction.
Respiratory syncytial virus (RSV) is responsible for 70% of cases of bronchiolitis. Transmission of RSV is direct, through inhalation of droplets (coughing, sneezing), and indirect, through contact with hands or materials contaminated by infected secretions.
In the majority of cases, bronchiolitis is benign, resolves spontaneously (relapses are possible), and can be treated on an outpatient basis.
Severe cases may occur, which put the child at risk due to exhaustion or secondary bacterial infection. Hospitalisation is necessary when signs/criteria of severity are present (10 to 20% of cases).

Clinical features

– Tachypnoea, dyspnoea, wheezing, cough; profuse, frothy, obstructive secretions.
– On auscultation: prolonged expiration with diffuse, bilateral wheezes; sometimes diffuse fine, end-inspiratory crackles.

Rhinopharyngitis, with dry cough, precedes these features by 24 to 72 hours; fever is absent or moderate.

– Signs of severity:
  • Significant deterioration in general condition, toxic appearance (pallor, greyish colouration)
  • Apnoea, cyanosis (check lips, buccal mucosa, fingernails)
  • Respiratory distress (nasal flaring, sternal and chest wall indrawing)
  • Anxiety and agitation (hypoxia), altered level of consciousness
  • Respiratory rate > 60/min
  • Decreased respiratory distress and slow respirations (< 30/min below the age of 1 year and < 20/min below the age of 3 years, exhaustion). Exercise caution in interpreting these signs as indicators of clinical improvement.
  • Sweats, tachycardia at rest and in the absence of fever
  • Silence on auscultation (severe bronchospasm)
  • Difficulty drinking or sucking (reduced tolerance for exertion)

Treatment

Treatment is symptomatic. Obstructive signs and symptoms last for about 10 days; cough may persist for 2 weeks longer.

Hospitalise children with one of the following criteria:
– Presence of any sign of severity
– Pre-existing pathology (cardiac or pulmonary disease, malnutrition, HIV, etc.)

Consider hospitalisation on a case-by-case basis in the following situations:
– Associated acute pathology (viral gastro-enteritis, bacterial infection, etc.)
– Age less than 3 months

In all other cases, the child may be treated at home, provided the parents are taught how to carry out treatment, and what signs of severity should lead to re-consultation.

Outpatient treatment

– Nasal irrigation with 0.9% NaCl before each feeding (demonstrate the technique to the mother)[a].
– Small, frequent feedings to reduce vomiting triggered by bouts of coughing.
– Increased fluids if fever and/or significant secretions are present.
– Treat fever (Chapter 1).
– Handle the patient the patient as little as possible and avoid unnecessary procedures.

Hospitalisation

– In all cases:
  • Place the infant in a semi-reclining position (± 30°).
  • Nasal irrigation, small, frequent feeds, treatment of fever: as for outpatient treatment.
  • Gentle oro-pharyngeal suction if needed.
  • Monitor fluid intake: normal requirements are 80 to 100 ml/kg/day + 20 to 25 ml/kg/day with high fever or very profuse secretions.
– According to symptoms:
  • Humidified nasal oxygen (1 to 2 litres/min).
  • When there is vomiting or significant fatigue when sucking, fluid requirements may be administered by nasogastric tube (small volumes on a frequent basis) or the IV route, for the shortest possible time. Avoid breastfeeding or oral feeds in children with severe tachypnoea, but do not prolong NG feeds (respiratory compromise) or IV infusions any longer than necessary.
  • Bronchodilator therapy: this therapy may be considered after a trial treatment has been given (**salbutamol** inhaler, 100 micrograms/puff: 2 to 3 puffs with spacer, repeated twice at an interval of 30 minutes). If inhaled salbutamol appears effective in relieving symptoms, the treatment is continued (2 to 3 puffs every 6 hours in the acute phase, then gradual reduction as recovery takes place). If the trial is ineffective, the treatment is discontinued.
  • Antibiotics are not indicated unless there is concern about complications such as secondary bacterial pneumonia.

Prevention and control

The risk of transmission of the virus is increased in hospital settings:
– Children with bronchiolitis should be grouped together, away from other children (cohorting).
– As infection is most commonly transmitted by the hands, the most important prevention measure is hand-washing after any contact with patients, and objects or surfaces in contact with patients on which the virus may survive for several hours.
– In addition, staff should wear gowns, gloves and surgical masks when in contact with patients.

[a] Lie the child on his back, head turned to the side and instil 0.9% NaCl into the nose, one nostril at a time.

Acute pneumonia

Acute pneumonia is a viral, bacterial (pneumococcus, *Haemophilus influenzae*, staphylococcus, atypical bacteria) or parasitic (pneumocystosis) infection of the pulmonary alveoli.

Pneumonia in children under 5 years of age

The most common causes are viruses, pneumococcus and *Haemophilus influenzae*.

Clinical examination must be done on a calm child in order to correctly count the respiratory rate and look for signs of serious illness.

Clinical features

Pneumonia should be suspected in a child who presents with *cough* or *difficulty breathing*.
Fever is often high (> 39°C), but the child may present with low-grade fever or may have no fever (often a sign of serious illness).
The respiratory rate (RR) should be measured over 1 minute. A child has tachypnoea (increased respiratory rate) if:

RR ≥ 60 breaths/minute in children under 2 months
RR ≥ 50 breaths/minute in children from 2 to 11 months
RR ≥ 40 breaths/minute in children from 12 months to 5 years

On pulmonary auscultation: dullness with diminished vesicular breath sounds, crepitations and sometimes bronchial breathing or normal pulmonary auscultation.

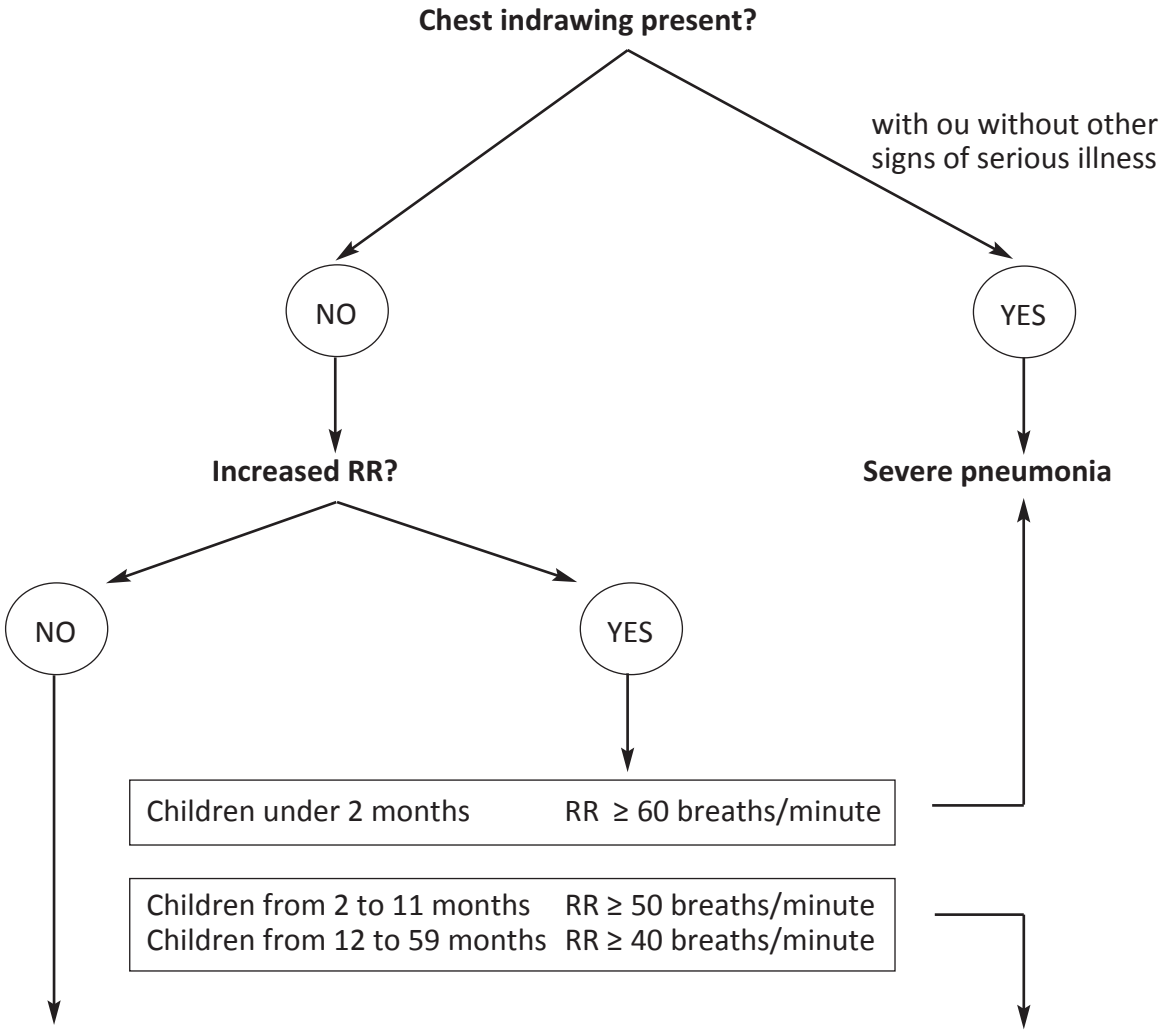
Signs of serious illness (severe pneumonia) include:
– Chest indrawing: the inferior thoracic wall depresses on inspiration as the superior abdomen expands
– Cyanosis (lips, oral mucosa, fingernails) or O_2 saturation < 90%
– Nasal flaring
– Altered consciousness (child is abnormally sleepy or difficult to wake)
– Stridor (hoarse noise on inspiration)
– Grunting (a short repetitive noise produced by a partial closure of the vocal cords) on expiration
– Refusal to drink or feed
– Children under 2 months
– Severe malnutrition

Notes:
– In malnourished children, the RR thresholds should be decreased by 5 breaths/minute from those listed above.
– Chest indrawing is significant if it is clearly visible and present at all times. If it is observed when a child is upset or feeding and is not visible when the child is resting, there is no chest indrawing.
– In children under 2 months of age, moderate chest indrawing is normal as the thoracic wall is flexible.
– If only the soft tissues between the ribs or above the clavicles depress, there is no chest indrawing.

Consider also:

– Malaria in endemic areas, as it may also cause cough and tachypnoea.
– Staphylococcal pneumonia in patients with empyema or painful abdominal swelling and diarrhoea.
– Pneumocystosis in patients with confirmed or suspected HIV infection (see HIV infection and AIDS, page 230, Chapter 8).
– Tuberculosis:
  • in a child with cough, fever and poor weight gain and a history of close contact with a tuberculous patient[a]. For the diagnosis, refer to the MSF handbook, *Tuberculosis*.
  • in the event of pneumonia complicated with empyema (pus in the pleural space).

Diagnosis of pneumonia in children under 5 presenting with cough or difficulty breathing:



[a] Contact is defined as living in the same household, or in close and regular contact with any known or suspected TB case within the last 12 months.

Treatment

Severe pneumonia (inpatient treatment)

Infants under 2 months of age

The first line treatment is the combination **ampicillin** slow IV (3 minutes) for 10 days + **gentamicin** slow IV (3 minutes) or IM for 5 days:

Children 0 - 7 days	< 2 kg	**ampicillin** 100 mg/kg/day in 2 divided doses + **gentamicin** 3 mg/kg once daily
	≥ 2 kg	**ampicillin** 150 mg/kg/day in 3 divided doses + **gentamicin** 5 mg/kg once daily
Children 8 days - < 1 month		**ampicillin** 150 mg/kg/day in 3 divided doses + **gentamicin** 5 mg/kg once daily
Children 1 month - < 2 months		**ampicillin** 200 mg/kg/day in 3 or 4 divided doses + **gentamicin** 6 mg/kg once daily

For ampicillin, IV route is preferred but IM route may be an alternative.

benzylpenicillin procain IM, 50 000 IU/kg once daily (50 mg/kg once daily) for 10 days (combined with gentamicin IM as above), may be an alternative to ampicillin in contexts where ampicillin cannot be properly administered. However ampicillin remains the drug of choice. Benzylpenicillin procain must NEVER be administered by IV route.

If penicillins are not available, alternatives may be **cefotaxime** slow IV (3 minutes) or infusion (20 minutes) or IM for 10 days (for doses, see Meningitis, Chapter 7), or, as a last resort: **ceftriaxone** slow IV[b] (3 minutes) or infusion (30 minutes; 60 minutes in neonates) or IM: 50 mg/kg once daily for 10 days.

If the child's condition does not improve[c] after 48 hours of well administered treatment, add **cloxacillin** IV for 10 to 14 days:

Children 0 - 7 days	< 2 kg	**cloxacillin** 100 mg/kg/day in 2 divided doses
	≥ 2 kg	**cloxacillin** 150 mg/kg/day in 3 divided doses
Children > 7 days	< 2 kg	**cloxacillin** 150 mg/kg/day in 3 divided doses
	≥ 2 kg	**cloxacillin** 200 mg/kg/day in 4 divided doses

Children from 2 months to 5 years of age

The first line treatment is:
ceftriaxone IM or slow IV[b] (3 minutes): 50 mg/kg once daily
or
ampicillin slow IV (3 minutes) or IM: 200 mg/kg/day in 3 to 4 divided doses
+ **gentamicin** slow IV (3 minutes) or IM: 6 mg/kg once daily
Ampicillin is preferably administered in 4 divided doses. If the context does not permit it, the daily dose must be divided in at least 3 injections.

[b] The solvent of ceftriaxone for IM injection contains lidocaine. Ceftriaxone reconstituted using this solvent must never be administered by IV route. For IV administration, water for injection must always be used.

[c] Improvement criteria include: fever reduction, diminished respiratory distress, improved O_2 saturation, improved appetite and/or activity.

The treatment is administered by parenteral route for at least 3 days then, if the clinical condition has improved[d] and oral treatment can be tolerated, switch to the oral route with **amoxicillin** PO: 100 mg/kg/day in 3 divided doses, to complete 10 days of treatment.

If the child's condition deteriorates or does not improve after 48 hours of correct administration, add **cloxacillin** IV: 100 to 200 mg/kg/day in 4 divided doses. After clinical improvement and 3 days with no fever, switch to the oral route with **amoxicillin/clavulanic acid** (**co-amoxiclav**) PO to complete 10 to 14 days of treatment:
The dose is expressed in amoxicillin: 100 mg/kg/day in 2 divided doses (if using formulations in a ratio of 8:1 or 7:1)[e].
The dose of clavulanic acid should not exceed 12.5 mg/kg/day or 375 mg/day.

If the child's condition does not improve after 48 hours with ceftriaxone + cloxacillin, consider tuberculosis. For the diagnosis, refer to the MSF handbook, *Tuberculosis*.

If tuberculosis is unlikely, continue with ceftriaxone + cloxacillin and add azithromycin (see Atypical pneumonia).

Notes:
– For malnourished children, refer to specific protocol.
– In the event of moderate-large empyema, assess if drainage is required. Administer antibiotics active against pneumococci and staphylococci (see Staphylococcal pneumonia).

Adjuvant therapy

– Fever: paracetamol PO (Chapter 1).
– Infants: keep warm.
– Install on an incline (head elevated) or in semi-sitting position.
– Clear the airway (nasal irrigation with 0.9% sodium chloride if needed).
– Oxygen at the flow rate required to maintain $SpO_2 \geq 90\%$ or, if pulse oxymeter is not available, minimum 1 litre/minute.
– Maintain adequate hydration and nutrition:
  • In children with severe respiratory difficulty: place an IV line and give 70% of normal maintenance fluids. Resume oral feeding as soon as possible (no severe respiratory difficulty, ability to eat normally).
  Use a nasogastric tube only if an IV line cannot be established: children under 12 months: 5 ml/kg/hour; children over 12 months: 3 to 4 ml/kg/hour; alternate milk and water. Resume normal oral feeding as soon as possible.
  • In the absence of severe respiratory difficulty: breastfeed on demand; milk/food and water by spoon on demand.
  • ORS when required (Appendix 2).

Pneumonia with no signs of serious illness

Infant under 2 months of age

Admit the child for inpatient care and treat for severe pneumonia.

Children from 2 months to 5 years of age (outpatients, except young infants)

amoxicillin PO: 100 mg/kg/day in 3 divided doses for 5 days

[d] Improvement criteria include: fever reduction, diminished respiratory distress, improved O_2 saturation, improved appetite and/or activity.

[e] If the only formulations of co-amoxiclav available are those with a 4:1 ratio, the dose is: 50 mg/kg/day.

Follow-up in 48 to 72 hours or sooner if the child's condition deteriorates:
– If the condition is improving[f]: continue with the same antibiotic to complete treatment.
– If there is no improvement after 3 days of correct administration: add azithromycin (see Atypical pneumonia).
– If the condition is deteriorating: hospitalise and treat as severe pneumonia.

Pneumonia in children over 5 years and adults

The most common causes are viruses, pneumococcus, and *Mycoplasma pneumoniae*.

Clinical features

– Cough, with or without purulent sputum, fever, thoracic pain, tachypnoea
– On pulmonary auscultation: decreased vesicular breath sounds, dullness, localised foci of crepitations, sometimes bronchial wheeze.

Sudden onset with high fever (higher than 39°C), thoracic pain and oral herpes are suggestive of pneumococcal infection. Symptoms may be confusing, particularly in children with abdominal pain, meningeal syndrome, etc.

Signs of serious illness (severe pneumonia) include:
– Cyanosis (lips, oral mucosa, fingernails)
– Nasal flaring
– Iintercostal or subclavial indrawing
– RR > 30 breaths/minute
– Heart rate > 125 beats/minute
– Altered level of consciousness (drowsiness, confusion)

Patients at risk include the elderly, patients suffering from heart failure, sickle cell disease or severe chronic bronchitis; immunocompromised patients (severe malnutrition, HIV infection with CD4 < 200).

Treatment

Severe pneumonia (inpatient treatment)

benzylpenicillin procaine IM
Children: 50 000 IU/kg once daily
Adults: 1.5 MIU once daily
Benzylpenicillin procain must NEVER be administered by IV route.
The treatment is given by parenteral route for at least 3 days then, if the clinical condition has improved[f] and oral treatment can be tolerated, switch to the oral route with **amoxicillin** PO to complete 7 to 10 days of treatment:
Children: 100 mg/kg/day in 3 divided doses
Adults: 3 g/day in 3 divided doses

[f] Improvement criteria include: fever reduction, diminished respiratory distress, improved O_2 saturation, improved appetite and/or activity.

or
ceftriaxone IM or slow IV[g] (3 minutes)
Children: 50 mg/kg once daily
Adults: 1 g once daily
The treatment is given by parenteral route for at least 3 days then, if the clinical condition has improved[h] and oral treatment can be tolerated, switch to the oral route with amoxicillin PO as above, to complete 7 to 10 days of treatment.
or
ampicillin slow IV (3 minutes) or IM
Children: 200 mg/kg/day in 3 to 4 divided doses
Adults: 3 to 4 g/day in 3 to 4 divided doses
Ampicillin is preferably administered in 4 divided doses. If the context does not permit it, the daily dose must be divided in at least 3 injections.
The treatment is given by parenteral route for at least 3 days then, if the clinical condition has improved[h] and oral treatment can be tolerated, switch to the oral route with amoxicillin PO as above, to complete 7 to 10 days of treatment.

If the clinical condition deteriorates or does not improve after 48 hours of correct administration, administer ceftriaxone as above + **cloxacillin** IV:
Children: 100 to 200 mg/kg/day in 4 divided doses
Adults: 8 g/day in 4 divided doses
After clinical improvement and 3 days with no fever, switch to the oral route with **amoxicillin/clavulanic acid** (**co-amoxiclav**) PO to complete 10 to 14 days of treatment:
The dose is expressed in amoxicillin:
Children: 100 mg/kg/day in 2 divided doses (if using formulations in a ratio of 8:1 or 7:1)[i]
The dose of clavulanic acid should not exceed 12.5 mg/kg/day or 375 mg/day.
Adults: 2.5 to 3 g/day in 3 divided doses. Depending on the formulation of co-amoxiclav available:
Ratio 8:1: 3000 mg/day = 2 tablets of 500/62.5 mg 3 times per day
Ratio 7:1: 2625 mg/day = 1 tablet of 875/125 mg 3 times per day
The dose of clavulanic acid should not exceed 375 mg/day.

If the clinical condition does not improve after 48 hours with ceftriaxone + cloxacillin, consider tuberculosis. For the diagnosis, refer to the MSF handbook, *Tuberculosis*.

If tuberculosis is unlikely, continue with ceftriaxone + cloxacillin and add azithromycin (see atypical pneumonia).

Adjuvant therapy

- Fever: paracetamol PO (Chapter 1).
- Clear the airway (nasal irrigation with 0.9% sodium chloride if needed).
- Oxygen at the flow rate required to maintain $SpO_2 \geq 90\%$ or, if pulse oxymeter is not available, minimum 1 litre/minute.
- Maintain adequate hydration and nutrition.

[g] The solvent of ceftriaxone for IM injection contains lidocaine. Ceftriaxone reconstituted using this solvent must never be administered by IV route. For IV administration, water for injection must always be used.

[h] Improvement criteria include: fever reduction, diminished respiratory distress, improved O_2 saturation, improved appetite and/or activity.

[i] If the only formulations of co-amoxiclav available are those with a 4:1 ratio, the dose is: 50 mg/kg/day.

Pneumonia without signs of serious illness (outpatient treatment)

amoxicillin PO
Children: 100 mg/kg/day in 3 divided doses for 5 days
Adults: 3 g/day in 3 divided doses for 5 days

Follow-up in 48 to 72 hours or sooner if the child's condition deteriorates:
– If the condition is improving[j]: continue with the same antibiotic to complete treatment.
– If there is no improvement after 3 days of correct administration: add azithromycin (see Atypical pneumonia).
– If the condition is deteriorating: hospitalise and treat as severe pneumonia.

Persistent pneumonia

In patients not responding to therapy, consider atypical pneumonia, tuberculosis, pneumocystosis (HIV infection and AIDS, page 230, Chapter 8).

Bacteria responsible for atypical pneumonia are mainly *Mycoplasma pneumoniae* and *Chlamydophila pneumoniae*. If suspected, one of the following antibiotics may be used:

First choice, **azithromycin** PO
Children: 10 mg/kg once daily (max. 500 mg/day) for 5 days
Adults: 500 mg on D1 then, 250 mg once daily from D2 to D5

If not available,
erythromycin PO
Children: 30 to 40 mg/kg/day in 4 divided doses for 10 to 14 days
Adults: 2 g/day in 4 divided doses for 10 to 14 days
or
doxycycline PO (except in children under 8 years and pregnant or lactating women)
Children: 4 mg/kg/day (max. 200 mg/day) in 2 divided doses for 10 to 14 days
Adults: 200 mg/day in 2 divided doses for 10 to 14 days

[j] Improvement criteria include: fever reduction, diminished respiratory distress, improved O_2 saturation, improved appetite and/or activity.

Staphylococcal pneumonia

Pneumonia due to *Staphylococcus aureus* affecting young children, often those in a poor general condition (malnutrition, skin lesions, etc.). Staphylococcal pneumonia is a classic complication of measles.

Clinical features

- General signs: change in overall condition, pallor, high fever or hypothermia, frequently signs of shock; presence of skin lesions (point of bacterial entry), however, skin lesions may be absent.
- Gastrointestinal signs: nausea, vomiting, diarrhoea, painful abdominal distention.
- Respiratory signs: dry cough, tachypnoea, signs of distress (nasal flaring, chest indrawing). Pulmonary auscultation is often normal; sometimes dullness indicating pleural effusion.

If possible, take a chest X-ray: the presence of bullae confirms the diagnosis. Pleural effusion, often unilateral, may also be seen.

Treatment

Treatment is urgent as patients deteriorate quickly: hospitalise.

- Antibiotic treatment: if staphylococcal aetiology cannot be confirmed or while waiting for confirmation, a broad spectrum antibiotic therapy is recommended:
  ceftriaxone IM or slow IV[a] (at least 3 minutes): 50 mg/kg once daily
  + **cloxacillin** IV infusion (60 minutes)[b]
  Neonates 0 to 7 days (< 2 kg): 100 mg/kg/day in 2 divided doses
  Neonates 0 to 7 days (≥ 2 kg): 150 mg/kg/day in 3 divided doses
  Neonates 8 days to < 1 month (< 2 kg): 150 mg/kg/day in 3 divided doses
  Neonates 8 days to < 1 month (≥ 2 kg): 200 mg/kg/day in 4 divided doses
  Children 1 month and over: 100 to 200 mg/kg/day in 4 divided doses (max. 8 g/day)

  After clinical improvement[c], 3 days with no fever, and drain removal if any, switch to the oral route with **amoxicillin/clavulanic acid** PO to complete 10 to 14 days:
  The dose is expressed in amoxicillin:
  100 mg/kg/day in 2 divided doses (if using formulations in a ratio of 8:1 or 7:1)[d]
  The dose of clavulanic acid should not exceed 12.5 mg/kg/day or 375 mg/day.

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[a] The solvent of ceftriaxone for IM injection contains lidocaine. Ceftriaxone reconstituted using this solvent must never be administered by IV route. For IV administration, water for injection must always be used.

[b] Cloxacillin powder for injection should be reconstituted in 4 ml of water for injection. Then dilute each dose of cloxacillin in 5 ml/kg of 0.9% sodium chloride or 5 % glucose in children less than 20 kg and in a bag of 100 ml of 0.9% sodium chloride or 5% glucose in children over 20 kg and in adults.

[c] Improvement criteria include: fever reduction, diminished respiratory distress, improved O_2 saturation, improved appetite and/or activity.

[d] If the only formulations of co-amoxiclav available are those with a 4:1 ratio, the dose is: 50 mg/kg/day.

In the event of large empyema: same treatment but switch to the oral route after 7 days with no fever and treat for 3 weeks.

Clindamycin IV may be an alternative to cloxacillin: 30 mg/kg/day in 3 divided injections then switch to clindamycin PO at the same dose, according to the criteria above.

– Fever: paracetamol (Chapter 1).

– Hydration by oral route or infusion or nasogastric tube depending on clinical condition (see page 73).

– Oxygen at the flow rate required to maintain $SpO_2 \geq 90\%$ or, if pulse oxymeter is not available, minimum 1 litre/minute.

– Local disinfection of skin lesions.

– If there is significant pleural effusion: pleural tap with drainage (for pyopneumothorax; insert 2 drains, one anterior and one posterior) or without drainage (for suppurative pleurisy, make repetitive taps with an IV catheter).

Clinical evolution

– There is a serious risk of decompensation from pneumothorax or suppurative pleurisy or pyopneumothorax.

– On a paediatric ward, adequate equipment for urgent pleural drainage should always be available.

Asthma

Asthma is a chronic inflammatory disorder of the airways associated with airway hyper-responsiveness that leads to recurrent episodes of wheezing, breathlessness, chest tightness and coughing. These episodes are usually associated with airflow obstruction within the lung, often reversible, either spontaneously or with treatment.

Factors that precipitate/aggravate asthma include: allergens, infection, exercise, drugs (aspirin), tobacco, etc.

In young children, most initial episodes of asthma-like symptoms are associated with a respiratory tract infection, with no symptoms between infections. Wheezing episodes usually become less frequent with time; most of these children do not develop asthma.

Asthma attack (acute asthma)

Asthma attack is a substantial worsening of asthma symptoms. The severity and duration of attacks are variable and unpredictable.

Assessment of the severity of asthma attack

The severity of the asthma attack must be rapidly evaluated by the following clinical criteria. Not all signs are necessarily present.

Assessment of severity in children under 2 years and adults

Mild to moderate attack	Severe attack	Life threatening attack
Able to talk in sentences **Respiratory rate (RR)** Children 2-5 years ≤ 40/min Children > 5 years ≤ 30/min **Pulse** Children 2-5 years ≤ 140/min Children > 5 years ≤ 125/min and **No criteria of severity**	**Cannot complete sentences in one breath** or **Too breathless to talk or feed** **RR** Children 2-5 years > 40/min Children > 5 years > 30/min Adults ≥ 25/min **Pulse** Children 2-5 years > 140/min Children > 5 years > 125/min Adults ≥ 110/min **O_2 saturation ≥ 92%**	**Altered level of consciousness** (drowsiness, confusion, coma) **Exhaustion** **Silent chest** **Paradoxical thoracoabdominal movement** **Cyanosis** **Collapse** **Bradycardia in children or arrhythmia/hypotension in adults** **O_2 saturation ≥ 92%**

Treatment

Treatment and follow-up depend on the severity of the attack and the patient's response:

Mild to moderate attack

– Reassure the patient; place him in a 1/2 sitting position.

– Administer:
  • **salbutamol** (aerosol): 2 to 4 puffs every 20 to 30 minutes, up to 10 puffs if necessary during the first hour. In children, use a spacer[a] to ease administration (use face mask in children under 3 years). Single puffs should be given one at a time, let the child breathe 4 to 5 times from the spacer before repeating the procedure.
  • **prednisolone** PO: one dose of 1 to 2 mg/kg

– If the attack is completely resolved: observe the patient for 1 hour (4 hours if he lives far from the health centre) then give outpatient treatment: salbutamol for 24 to 48 hours (2 to 4 puffs every 4 to 6 hours depending on clinical evolution) and prednisolone PO (1 to 2 mg/kg once daily) to complete 3 days of treatment.

– If the attack is only partially resolved: continue with 2 to 4 puffs of salbutamol every 3 to 4 hours if the attack is mild; 6 puffs every 1 to 2 hours if the attack is moderate, until symptoms subside, then when the attack is completely resolved, proceed as above.

– If symptoms worsen or do not improve, treat as *severe attack*.

Severe attack

– Hospitalise the patient; place him in a 1/2 sitting position.

– Administer:
  • **oxygen** continuously, at least 5 litres/minute or maintain the O_2 saturation between 94 and 98%.
  • **salbutamol** (aerosol): 2 to 4 puffs every 20 to 30 minutes, up to 10 puffs if necessary in children under 5 years, up to 20 puffs in children over 5 years and adults. Use a spacer to increase effectiveness, irrespective of age.
    or **salbutamol** (solution for nebulisation), see following page.
  • **prednisolone** PO: one dose of 1 to 2 mg/kg
  In the case of vomiting, use **hydrocortisone** IV every 6 hours (children: 5 mg/kg/injection, adults: 100 mg/injection) until the patient can tolerate oral prednisolone.

– If the attack is completely resolved, observe the patient for at least 4 hours. Continue the treatment with **salbutamol** for 24 to 48 hours (2 to 4 puffs every 4 hours) and **prednisolone** PO (1 to 2 mg/kg once daily) to complete 3 days of treatment.
  Reassess after 10 days: consider long-term treatment if the asthma attacks have been occurring for several months. If the patient is already receiving long-term treatment, reassess the severity of the asthma (see table page 83) and review compliance and correct use of medication and adjust treatment if necessary.

– If symptoms worsen or do not improve, see Life-threatening attack next page.

[a] If a conventional spacer is not available, use a 500 ml plastic bottle: insert the mouthpiece of the inhaler into a hole made in the bottom of the bottle (the seal should be as tight as possible). The child breathes from the mouth of the bottle in the same way as he would with a spacer. The use of a plastic cup instead of a spacer is not recommended (ineffective).

Life-threatening attack (intensive care)

– Insert an IV line.

– Administer:
  • **oxygen** continuously, at least 5 litres/minute or maintain the O_2 saturation between 94 and 98%.
  • **salbutamol** + **ipratropium**, solutions for nebulisation:

Children 1 month to < 5 years	**salbutamol** 2.5 mg + **ipratropium** 0.25 mg every 20 to 30 minutes
Children 5 to < 12 years	**salbutamol** 2.5 to 5 mg + **ipratropium** 0.25 mg every 20 to 30 minutes
Children 12 years and over and adults	**salbutamol** 5 mg + **ipratropium** 0.5 mg every 20 to 30 minutes

  The two solutions can be mixed in the nebuliser reservoir. The solutions must be administered via an oxygen-driven nebuliser.
  • corticosteriods (prednisolone PO or hydrocortisone IV) as for severe attack.

– If the attack is resolved after one hour: switch to salbutamol aerosol and continue prednisolone PO as for severe attack.

– If symptoms do not improve after one hour:
  • administer a single dose of **magnesium sulfate** by IV infusion in 0.9% sodium chloride over 20 minutes, monitoring blood pressure:
  Children over 2 years: 40 mg/kg
  Adults: 1 to 2 g
  • continue salbutamol by nebulisation and corticosteriods, as above.

Notes:
– In pregnant women, treatment is the same as for adults. In mild or moderate asthma attacks, administering oxygen reduces the risk of foetal hypoxia.
– For all patients, irrespective of the severity of the asthma attack, look for underlying lung infection and treat accordingly.

Chronic asthma

Clinical features

– Asthma should be suspected in patients with episodic respiratory symptoms (wheezing, chest tightness, shortness of breath and/or cough) of variable frequency, severity and duration, disturbing sleep, and causing the patient to sit up to breathe. These symptoms may appear during or after exercise.

– Chest auscultation may be normal or demonstrate diffuse sibilant wheezes.

– Atopic disorders or a personal or family history of atopy (eczema, allergic rhinitis/conjunctivitis) or a family history of asthma increases probability of asthma but their absence does not exclude asthma.

Patients with typical symptoms of asthma and a history of disease that is characteristic of asthma should be considered as having asthma after exclusion of other diagnoses.

The assessment of the frequency of daytime and nigthtime symptoms and limitations of physical activity determines whether asthma is *intermittent* or *persistent*.

Treatment

Only patients with persistent asthma need long-term treatment. The mainstay of treatment is inhaled corticosteroids. Treatment is started at the step most appropriate to initial severity then, re-evaluated and adjusted according to clinical response. It aims to abolish symptoms with the lowest possible dose of inhaled corticosteroids. An intervening severe exacerbation or loss of control necessitates reassessment to re-evaluate treatment.

Long-term treatment does not mean treatment for life. Asthma attacks may occur over months or years, with intervening asymptomatic intervals when long-term treatment is not required.

Long-term treatment of asthma according to severity

Categories	Treatment
Intermittent asthma • Intermittent symptoms (< once/week) • Night time symptoms < twice/month • Normal physical activity	No long term treatment Inhaled **salbutamol** when symptomatic
Mild persistent asthma • Symptoms > once/week, but < once/day • Night time symptoms > twice/month • Symptoms may affect activity	Continuous treatment with inhaled **beclometasone** + Inhaled **salbutamol** when symptomatic
Moderate persistent asthma • Daily symptoms • Symptoms affect activity • Night time symptoms > once/week • Daily use of salbutamol	Continuous treatment with inhaled **beclometasone** + Inhaled **salbutamol** (1 puff 4 times/day)
Severe persistent asthma • Daily symptoms • Frequent night time symptoms • Physical activity limited by symptoms	Continuous treatment with inhaled **beclometasone** + Inhaled **salbutamol** (1-2 puff/s 4 to 6 times/day)

Inhaled corticosteroid treatment: **beclometasone** dose varies according to the severity of asthma. Find the minimum dose necessary to both control the symptoms and avoid local and systemic adverse effects:
Children: 50 to 100 micrograms twice daily depending on the severity. Increase to 200 micrograms twice daily if the symptoms are not controlled. In patients with severe chronic asthma the dosage may be as high as 800 micrograms/day.
Adults: start with 250 to 500 micrograms twice daily depending on to the severity. If a total dosage of 1000 micrograms/day (in 2 to 4 divided doses) is ineffective, the dosage may be increased to 1500 micrograms/day, but the benefits are limited.

⚠ The number of puffs of beclometasone depends on its concentration in the inhaled aerosol: 50, 100 or 250 micrograms/puff.

Do not restrict exercise. If exercise is a trigger for asthma attacks, administer 1 or 2 puffs of salbutamol 10 minutes beforehand.

In pregnant women, poorly controlled asthma increases the risk of pre-eclampsia, eclampsia, haemorrhage, in utero growth retardation, premature delivery, neonatal hypoxia and perinatal mortality. Long-term treatment remains inhaled salbutamol and beclometasone at the usual dosage for adults. Whenever possible, avoid oral corticosteroids.

If symptoms are not well controlled during a period of at least 3 months, check the inhalation technique and adherence before changing to a stronger treatment.

If symptoms are well controlled for a period of at least 3 months (the patient is asymptomatic or the asthma has become *intermittent*): try a step-wise reduction in medication, finally discontinuing treatment, if it seems possible. Provide patients with a salbutamol inhaler for any possible attacks. Evaluate after 2 weeks. If the results are satisfactory, continue for 3 months and then re-evaluate. If the patient has redeveloped chronic asthma, restart long-term treatment, adjusting doses, as required.

Pulmonary tuberculosis

Pulmonary tuberculosis is a bacterial infection due to *Mycobacterium tuberculosis*, spread by airborne route. After contamination, *M. tuberculosis* multiplies slowly in the lungs: this represents the primary infection.
In immunocompetent patients, the pulmonary lesion heals in 90% of cases, but in 10%, patients develop active tuberculosis.
Tuberculosis may also be extrapulmonary: tuberculous meningitis, disseminated tuberculosis, lymph node tuberculosis, spinal tuberculosis, etc.

Patients with HIV infection have an increased risk of developing active tuberculosis. Tuberculosis is the opportunistic disease that most commonly reveals AIDS. In certain countries, up to 70% of patients with tuberculosis are co-infected with HIV.

Clinical features

Prolonged cough (> two weeks), sputum production, chest pain, weight loss, anorexia, fatigue, moderate fever, and night sweats.
The most characteristic sign is haemoptysis (presence of blood in sputum), however it is not always present and haemoptysis is not always due to tuberculosis. If sputum is smear-negative, consider pulmonary distomatosis (Flukes, Chapter 6), melioidosis (Southeast Asia), profound mycosis or bronchial carcinoma.

In an endemic area, the diagnosis of tuberculosis is to be considered, in practice, for all patients consulting for respiratory symptoms for over two weeks who do not respond to non-specific antibacterial treatment.

Diagnosis

– Sputum smear microscopy; culture.
– Chest X-rays are useful for the diagnosis of smear negative tuberculosis and tuberculosis in children.

Treatment

The treatment is a combination of several of the following antituberculous drugs [isoniazid (H), rifampicin (R), pyrazinamide (Z), ethambutol (E), streptomycin (S)]. The regimen is standardised and organized into 2 phases (initial phase and continuation phase).
The treatment of drug-sensitive tuberculosis lasts a minimum of 6 months.

It takes significant investment to cure a TB patient, both from the patient and the medical team. Only uninterrupted treatment for several months may lead to cure and prevent the development of resistance, which complicates later treatment. It is essential that the patient understands the importance of treatment adherence and that he has access to correct case management until treatment is completed.

Prevention

When BCG is correctly carried out, it confers protection that is not insignificant (probably over 50%). It has been proven that BCG protects against severe forms of the disease, in particular tuberculous meningitis and miliary tuberculosis.

BCG vaccination does not diminish transmission of tuberculosis.

For more information on the diagnosis, treatment and prevention of tuberculosis, and on the follow-up of tuberculosis patients, refer to the MSF handbook, *Tuberculosis*.

Chapter 3: Gastrointestinal disorders

Acute diarrhoea

Shigellosis

Amoebiasis

Disorders of the stomach and duodenum
- *Gastro-oesophageal reflux*
- *Gastric and duodenal ulcers in adults*
- *Dyspepsia*

Stomatitis
- *Oral and oropharyngeal candidiasis*
- *Oral herpes*
- *Other infectious causes*
- *Stomatitis from scurvy (vitamin C deficiency)*
- *Other lesions resulting from a nutritional deficiency*

Acute diarrhoea

– Acute diarrhoea is defined as at least 3 liquid stools per day for less than 2 weeks.

– There are 2 clinical types of acute diarrhoea:
  • *Simple diarrhoea without blood*, caused by viruses in 60% of cases (rotavirus, enterovirus), bacteria (*Vibrio cholerae*, enterotoxigenic *Escherichia coli*, non-typhi *Salmonella*, *Yersinia enterocolitica*) or parasites (*giardiasis*). Diseases, such as malaria, acute otitis media, upper and lower respiratory tract infections, etc. can be accompanied by this type of diarrhoea.
  • *Dysentery* or *bloody diarrhoea*, caused by bacteria (*Shigella* in 50% of cases, *Campylobacter jejuni*, enteroinvasive or enterohaemorrhagic *Escherichia coli*, *Salmonella*) or parasites (intestinal amoebiasis).

– Infectious diarrhoeas are transmitted by direct (dirty hands) or indirect (ingestion of contaminated water or food) contact.

– The high mortality rate from diarrhoeal diseases, even benign, is due to acute dehydration and malnutrition. This can be prevented by adequate rehydration and nutrition.

Clinical features

– First assess for signs of dehydration. See *Assessment of diarrhoeal patients for dehydration*, WHO (Appendix 2).

– Then look for other signs:
  • profuse watery diarrhoea (cholera, enterotoxigenic *E. coli*),
  • repeated vomiting (cholera),
  • fever (salmonella, viral diarrhoea),
  • presence of red blood in stools: see Shigellosis and Amoebiasis.

– In a patient over 5 years with severe and rapid onset of dehydration, suspect cholera.

Treatment

General principles:

– Prevent or treat dehydration: rehydration consists of prompt replacement of fluid and electrolyte losses as required, until the diarrhoea stops.

– Administer zinc sulfate to children under 5 years.

– Prevent malnutrition.

– Do not systematically administer antimicrobials: only certain diarrhoeas require antibiotics (see Antimicrobial treatment).

– Do not administer anti-diarrhoeal drugs or antiemetics.

– Treat the underlying condition if any (malaria, otitis, respiratory infection, etc.).

Prevention of dehydration (outpatient)

Follow Treatment plan A to treat diarrhoea at home, WHO (Appendix 2).

Treatment of dehydration

1st case: moderate dehydration (at dispensary level)

Follow Treatment plan B to treat dehydration, WHO (Appendix 2).

2nd case: severe dehydration (at hospital level)

Follow Treatment plan C to treat severe dehydration quickly, WHO (Appendix 2).

- In the event of *hypovolaemic shock* or if there is no improvement after one hour: increase the infusion rate.
- Check for signs of fluid overload: palpebral oedema is the first sign of overhydration. Stop rehydration until oedema disappear.
- If there are signs of acute pulmonary oedema (laryngeal crackles, dyspnoea and increased respiration rate, coughing with or without frothy sputum, distress, bilateral lung crepitations, tachycardia etc.), administer IV **furosemide** immediately and repeat after one to 2 hours if required:
  Children: 1 mg/kg/injection
  Adults: 40 mg/injection

Special situations

- Cholera
  In the event of severe dehydration, an adult may require up to 10 to 15 litres of **Ringer Lactate** (RL) on the first day. RL potassium content is low. There is a risk of symptomatic hypokalaemia in patients exclusively rehydrated by IV route. Thus, start oral rehydration solution (SRO) as soon as possible in patients under infusion.
- Oral rehydration and severe malnutrition
  Use standard rehydration salts (SRO) in cholera patients only. In all other cases, use ReSoMal (see Severe acute malnutrition, Chapter 1).

Zinc supplementation (in children under 5 years)

Zinc sulfate is given in combination with oral rehydration solution in order to reduce the duration and severity of diarrhoea, as well as to prevent further occurrences in the 2 to 3 months after treatment:

zinc sulfate PO

Children under 6 months: 10 mg once daily (1/2 tablet once daily) for 10 days
Children from 6 months to 5 years: 20 mg once daily (1 tablet once daily) for 10 days

Place the half-tablet or full tablet in a teaspoon, add a bit of water to dissolve it, and give the entire spoonful to the child.

Do not administer this treatment if the child receives ready-to-use therapeutic food (RUTF) which already contains zinc.

Prevention of malnutrition

Follow Treatment plan A to treat diarrhoea at home, WHO (Appendix 2).

Antimicrobial treatment

Diarrhoea without blood

Most acute diarrhoeas are caused by viruses unresponsive to antimicrobials. Antimicrobials can be beneficial in the event of cholera or giardiasis.

– *Cholera*: the most important part of treatment is rehydration. In the absence of resistance (perform antibiotic-sensitivity testing), antibiotic treatment shortens the duration of diarrhoea:
doxycycline PO
Children: 4 mg/kg as a single dose
Adults: 300 mg as a single dose
or
azithromycin PO
Children: 20 mg/kg as a single dose
Adults: 1 g as a single dose

Note: doxycycline is usually contraindicated in pregnant women and children under 8 years. However, for treating cholera, the administration of a single dose should not provoke any adverse effects. Check national recommendations.

– *Giardiasis*: tinidazole or metronidazole (see Intestinal protozoan infections, Chapter 6).

Bloody diarrhoea (dysentery)

– *Shigellosis* is the most frequent cause of dysentery (amoebic dysentery is much less common). If there is no laboratory diagnosis to confirm the presence of amoebae, first line treatment is for shigellosis.

– *Amoebiasis*: antiparasitic treatment only if motile E. histolytica amoebae are found in stools or if a correct shigellosis treatment has been ineffective (see Amoebiasis).

Prevention

– Breastfeeding reduces infant morbidity and mortality from diarrhoea and the severity of diarrhoea episodes.

– When the child is weaned preparation and storage of food are associated with the risk of contamination by faecal micro-organisms: discourage bottle-feeding; food must be cooked well; milk or porridge must never be stored at room temperature.

– Access to sufficient amounts of clean water and personal hygiene (washing hands with soap and water before food preparation and before eating, after defecation etc.) are effective methods of reducing the spread of diarrhoea.

Shigellosis

– There are 4 serogroups of shigella: *S. flexneri*, *S. boydii*, *S. sonnei* and *S. dysenteriae*. *Shigella dysenteriae* type 1 (Sd1) is the only strain that causes large scale epidemics. Of the 4 serogroups it has the highest case fatality rate (up to 10%).

– Ciprofloxacin is currently the only effective treatment for shigellosis. It is therefore essential to prevent the development of resistances.

Clinical features

Bloody diarrhoea with or without fever, abdominal pain and tenesmus, which is often intense.

Patients with at least one of the following criteria have an increased risk of death:

– Signs of serious illness:
  • fever > 38.5°C
  • malnutrition (< 80% of the median)
  • severe dehydration
  • confusion, seizures or coma
– Age groups at risk:
  • children under 5 years
  • adults over 50 years

Treatment

– Antibiotic treatment:
  • **ciprofloxacin** PO is the first line treatment
  Children: 30 mg/kg/day in 2 divided doses for 3 days
  Adults: 1 g/day in 2 divided doses for 3 days
  • In pregnant women, ciprofloxacin is contra-indicated in principle, use **ceftriaxone** IM: 1 g once daily for 3 to 5 days

  Amoxicillin is ineffective in vivo. The use of nalidixic acid favours the development of ciprofloxacin resistance.

– For pain:
  hyoscine butylbromide PO
  Children from 6 to 12 years: 10 mg, to be repeated every 8 hours if necessary
  Adults: 10 to 20 mg, to be repeated every 8 hours if necessary
  All opioid analgesics are contra-indicated as they slow peristalsis.

– Supportive therapy:
  • nutrition: all patients with dysentery should receive nutritional supplements.
  2500 kcal/day during hospitalisation
  1000 kcal/day as outpatients
  Children already in nutritional centres should be isolated.
  • rehydration: systematic administration of ORS (follow the WHO protocols, Appendix 2).

– Never give loperamide or any other antidiarrhoeal.

– Complications of shigellosis due to Sd1:
  • septicaemia: see *antibiotic treatment of septic shock* (Shock ,page 18, Chapter 1)
  • acute abdomen: see *antibiotic treatment of septic shock* (Shock, page 18, Chapter 1) and laparotomy
  • seizures: diazepam (Seizures, Chapter 1) and fluid restriction
  • moderate to severe haemolytic uraemic syndrome, may require transfusion and/or haemodialysis.

Shigellosis in an epidemic context (Sd1)

– Antibiotic resistance develops rapidly (sometimes during the course of an epidemic). After confirming the causal agent, antimicrobial susceptibility should be monitored monthly by culture and sensitivity tests.

– Patients presenting with signs of serious illness or with risk factors are hospitalised for the duration of treatment and are monitored daily (clinically and for compliance).

– Patients with neither signs of serious illness nor risk factors are treated as outpatients. Organise home visits for daily monitoring (clinically and for compliance); hospitalise if the patient develops signs of serious illness.

– Hygiene measures: isolate patients as for cholera, individual and collective hygiene. Shigellosis is an extremely contagious disease (the ingestion of 10 bacteria is infective).

Note: over the past few years, Sd1 epidemics of smaller scale and with lower case fatality rates (less than 1%) have been observed.

Amoebiasis

Amoebiasis is a parasitic infection due to the intestinal protozoa *Entamoeba histolytica*. Transmission is faecal-oral, by ingestion of amoebic cysts from food or water contaminated with faeces. Usually, ingested cysts release non-pathogenic amoebae and 90% of carriers are asymptomatic.
In 10% of infected patients, pathogenic amoebae penetrate the mucous of the colon: this is the intestinal amoebiasis (amoebic dysentery). The clinical picture is similar to that of shigellosis, which is the principal cause of dysentery.
Occasionally, the pathogenic amoebae migrate via the blood stream and form peripheral abscesses. Amoebic liver abscess is the most common form of extra-intestinal amoebiasis.

Clinical features

– *Amoebic dysentery*
  • diarrhoea containing red blood and mucus
  • abdominal pain, tenesmus
  • no fever or moderate fever
  • possibly signs of dehydration
– *Amoebic liver abscess*
  • painful hepatomegaly; mild jaundice may be present
  • anorexia, weight loss, nausea, vomiting
  • intermittent fever, sweating, chills; change in overall condition

Laboratory

– Amoebic dysentery: identification of mobile trophozoites (*E. histolytica histolytica*) in fresh stool samples
– Amoebic liver abscess: indirect haemoagglutination and ELISA

Treatment

– *Amoebic dysentery*
  • The presence of cysts alone should not lead to the treatment of amoebiasis.
  • Amoebiasis confirmed with a parasitological stool examination:
    tinidazole PO
    Children: 50 mg/kg once daily for 3 days (without exceeding 2 g/day)
    Adults: 2 g once daily for 3 days
    or **metronidazole** PO
    Children: 45 mg/kg/day in 3 divided doses for 5 days
    Adults: 1.5 g/day in 3 divided doses for 5 days
  • If there is no laboratory, first line treatment for dysentery is for shigellosis. Treat for amoebiasis if correct treatment for shigellosis has been ineffective.
  • Oral rehydration salts (**ORS**) if there is risk of, or if there are signs of dehydration (follow the WHO protocols, Appendix 2).
– *Amoebic liver abscess*
  • **tinidazole** PO: same treatment for 5 days
  • **metronidazole** PO: same treatment for 5 to 10 days

Disorders of the stomach and duodenum

Gastro-oesophageal reflux

Clinical features

Burning stomachache or heartburn, generally relieved by antacids; acid regurgitation (often postural: while sitting forward or lying down). In the absence of dysphagia (oesophageal stenosis), these signs are benign.

Treatment

– First instance, encourage the patient to avoid alcohol and tobacco use.
Give **aluminium hydroxide** PO[a]: 1.5 to 3 g/day in 3 divided doses one hour after meals or instruct the patient to take 500 mg at the time of a painful attack.

– If antacids are insufficient:
omeprazole PO: 20 mg once daily in the morning for 3 days
or, if not available:
cimetidine PO: 400 mg once daily at bedtime for 3 days

– In small children: no drug treatment, rest and sleep on an incline (30° to 45°).

Gastric and duodenal ulcers in adults

Clinical features

Burning epigastric pain or epigastric cramps between meals, that wake the patient at night. They are most characteristic when they occur as episodes of a few days and when accompanied by nausea and even vomiting.
The most common complications are perforation and bleeding.

Treatment of non-complicated ulcers

– For an isolated episode:
  • identify patients taking NSAID or acetylsalicylic acid; stop treatment;
  • encourage patients to avoid alcohol and tobacco use;
  • **omeprazole** PO: 20 mg once daily in the morning for 7 to 10 days
  or, if not available:
  cimetidine PO: 800 mg once daily at bedtime for 7 to 10 days

– If the patient has frequent recurrences, unrelated to NSAID use, that require repeated treatment with antiulcer drugs: see eradication of *Helicobacter pylori*, next page.

[a] Aluminium hydroxide may decrease absorption of drugs taken at the same time, leave an interval of at least 2 hours between taking aluminium hydroxide and other drugs.

Treatment of complicated ulcers

Perforation

Perforation should be considered in patients presenting with sudden onset intense epigastric pain, particularly if there is rigidity of the abdominal wall. The risk of peritonitis is increased if the perforation occurs on a full stomach.

– To start:
  - place the patient on a strict fast (NPO); insert a nasogastric tube and aspirate if possible;
  - place an intravenous line and hydrate (alternate between 5% glucose and Ringer Lactate);
  - **hyoscine butylbromide** IV or IM: 10 to 20 mg, to be repeated every 8 hours if necessary;
  - **omeprazole** IV infusion: 40 mg/day over 20 to 30 minutes
    or, if not available, **cimetidine** continuous IV infusion: 1600 mg over 24 hours
– Refer to a surgeon if the patient has eaten during the 6 hours prior to the onset of pain or if there is no improvement within 12 hours despite medical treatment.
– Continue treatment for 3 days then restart oral feeding if the perforation occurred on an empty stomach and if the patient improved during the first 12 hours of treatment. Then start PO treatment to eradicate *Helicobacter pylori* (see further).

Gastrointestinal bleeding

Passing of black stool (maelena) and/or vomiting blood (haematemesis). In 80% of cases the bleeding stops spontaneously.

– Insert a nasogastric tube for aspiration and insert an IV line (16G).

If the haemodynamic state is stable (pulse and blood pressure are normal):
– Hydrate (Ringer Lactate), monitor, keep NPO for 12 hours.
– If there is no active haemorrhage, restart oral feeding after 12 hours.
Gastric lavage with cold water is not essential, but may help evaluate persistence of bleeding.

If the haemorrhage continues (haematemesis) and/or *if the haemodynamic state deteriorates* (pulse increases, BP drops):
– Intensive care and transfusion according to the severity of the bleeding (see haemorrhagic shock, page 16, Chapter 1).
– Emergency surgical intervention.

Most peptic ulcers are caused by *Helicobacter pylori* infection. If a diagnosis of ulcer is probable, and the patient has frequent attacks requiring repeated treatment with antiulcer drugs or, in cases of complicated ulcers (perforation or gastrointestinal bleeding) treatment to eradicate H. pylori should be considered to prevent relapses.
Once the acute phase has passed, prescribe one of the following treatments:

Treatment of choice (10 days)	Alternative (14 days)
metronidazole PO[b] 1 g/day in 2 divided doses + **amoxicillin** PO 2 g/day in 2 divided doses + **omeprazole** PO 40 mg/day in 2 divided doses	**metronidazole** PO[b] 1 g/day in 2 divided doses + **amoxicillin** PO 2 g/day in 2 divided doses + **cimetidine** PO 1600 mg/day in 2 divided doses

[b] Metronidazole PO can be replaced with **tinidazole** PO: 1 g/day in 2 divided doses.

Notes:
– Acetylsalicylic acid (aspirin) and NSAID (indometacin, ibuprofen, diclofenac etc) are contra-indicated in patients suffering from or with a history of ulcers.
– Omeprazole is as effective PO as IV.

Dyspepsia

Clinical features

Epigastric pain or discomfort following meals, often accompanied by bloating, sensation of fullness and nausea. Dyspepsia is most commonly functional, linked with stress and not linked to the quantity of gastric acid (antiacids and antiulcer drugs are ineffective). Resolution is usually spontaneous.

Treatment

If the symptoms persist, short term symptomatic treatment may be considered.

In adults:
– **metoclopramide** PO (30 mg/day in 3 divided doses given 6 hours apart, 1/2 hour before meals, for 2 to 3 days) may be helpful in cases of nausea, vomiting, bloating, etc.
– **hyoscine butylbromide** PO (30 mg/day in 3 divided doses, 1/2 hour before meals, for 2 to 3 days) may be helpful in cases of spasmodic pain.

Note: consider and treat possible intestinal parasites (taeniasis, ascariasis, ancylostomiasis, giardiasis, amoebiasis).

Stomatitis

Stomatitis is an inflammation of the mucous membranes of the mouth caused by a fungal, viral or bacterial infection, a vitamin deficiency, an injury, etc.
Prolonged or painful stomatitis may contribute to dehydration or may cause loss of appetite with denutrition, particularly in children.
In infants, examine routinely the mouth in the event of breast refusal or difficulties in sucking.

In all cases:
– Maintain adequate hydration and feeding; offer foods that will not irritate the mucosa (soft, non-acidic). Use a nasogastric tube for a few days if pain is preventing the patient from eating.
– Keep the mouth clean to prevent complications and recurrence.

Oral and oropharyngeal candidiasis

Infection due to *Candida albicans*, common in infants, immunocompromised or diabetic patients. Other risk factors include treatment with oral antibiotics or high-dose inhaled corticosteroids.

Clinical features

White patches on the tongue, inside the cheeks, that may spread to the pharynx.

In patients with frequent recurrences or extensive forms invading the esophagus (swallowing difficulty and pain), consider HIV infection.

Treatment

To be taken between meals:
nystatin lozenge to be sucked or oral suspension: 400 000 IU/day i.e. I lozenge to be sucked or 1 ml of the oral suspension (100 000 IU) 4 times/day
or **miconazole** oral gel
Children 6 months to 2 years: 1.25 ml 4 times/day
Children over 2 years and adults: 2.5 ml 4 times/day

The oral suspension of nystatin or the oral gel of miconazole should be kept in the mouth for 2 to 3 minutes and then swallowed, or, in young children, applied to the tongue and inside of each cheek.

Show the mother how to treat since, in most cases, candidiasis will be treated at home.

In immunocompromised patients: see HIV infection and AIDS, page 229, Chapter 8.

Oral herpes

Infection due to the *herpes simplex* virus. Primary infection typically occurs in children aged 6 months-5 years and may cause acute gingivostomatitis, sometimes severe. After primary infection, the virus remains in the body and causes in some individuals periodic recurrences which are usually benign (herpes labialis).

Clinical features

– *Primary herpetic gingivostomatitis*
Multiple vesicles on the oral mucosa and lips which rupture to form painful, yellowish, at times extensive ulcers. Local lesions are usually associated with general malaise, regional lymphadenopathy and fever.

– *Recurrent herpes labialis*
Clusters of vesicles at the junction between the lip and the skin.

In patients with frequent recurrences or extensive forms, consider HIV infection (see page 229, Chapter 8).

Treatment

Primary herpetic gingivostomatitis

– Treat pain: paracetamol or ibuprofen PO (Chapter 1)

– In the event of severe lesions, inability to drink and significant pain:
  • Admit the child to hospital (high risk of dehydration).
  • If the child presents within the first 96 hours of symptoms onset, **aciclovir** PO for 5 to 7 days:
  Children under 2 years: 200 mg 5 times per day
  Children over 2 years: 400 mg 5 times per day

– In the event of secondary bacterial infection: amoxicillin PO 7 days.

In immunocompromised patients: see HIV infection and AIDS, page 229, Chapter 8.

Recurrent herpes labialis

Spontaneous resolution within 7 to 10 days. An antiseptic (chlorhexidine or polyvidone iodine) may be applied; paracetamol PO if necessary.

Both forms of herpes are contagious: do not touch lesions (or wash hands afterwards); avoid oral contact.

Other infectious causes

See Pharyngitis (Chapter 2), Diphtheria (Chapter 2), Measles (Chapter 8).

For scarlet fever (strawberry tongue associated with a skin rash):
phenoxymethylpenicillin (**pencillin V**) PO for 10 days
Children under 1 year: 250 mg/day in 2 divided doses
Children from 1 to 5 years: 500 mg/day in 2 divided doses
Children from 6 to 12 years: 1 g/day in 2 divided doses
Adults: 2 g/day in 2 divided doses

Stomatitis from scurvy (vitamin C deficiency)

Clinical features

Bleeding gums, associated in infants with lower limb pain caused by subperiosteal haemorrhage. It is common in contexts of poor food quality or in populations completely dependent on food aid (refugee camps).

Treatment

ascorbic acid (**vitamin C**) PO
Children: 150 to 200 mg/day in 3 or 4 divided doses
Adults: 500 to 750 mg/day in 3 or 4 divided doses

The treatment is continued until symptoms improve (1 to 2 weeks), then a preventive treatment (children and adults: 25 to 50 mg/day) is given as long as the situation requires.

Other lesions resulting from a nutritional deficiency

Other vitamin deficiencies may provoke mouth lesions: angular stomatitis of the lips and glossitis from vitamin B2 (riboflavin), niacin (see Pellagra, Chapter 4) or vitamin B6 (pyridoxine) deficiencies.

Iron deficiency may also provoke angular stomatitis (see Anaemia, Chapter 1).

Give the corresponding vitamins at curative doses. Multivitamins are insufficient to treat true vitamin deficiencies.

Chapter 4: Skin diseases

Dermatology

Scabies

Lice (pediculosis)

Superficial fungal infections

Bacterial skin infections
- *Impetigo*
- *Furuncles and carbuncles*
- *Erysipelas and cellulitis*

Cutaneous anthrax

Endemic treponematoses

Leprosy (Hansen's disease)

Herpes simplex and herpes zoster
- *Herpes simplex*
- *Herpes zoster (shingles)*

Other skin disorders
- *Eczema (dermatitis)*
- *Seborrheic dermatitis*
- *Urticaria*
- *Pellagra*

Dermatology

Skin diseases, particularly infectious skin diseases, are very common. They must be treated individually or collectively, but must also be considered as indicators of the sanitary condition of a population. A high prevalence of infectious skin diseases may reflect a problem of insufficient water quantity and lack of hygiene in a population.

Dermatological examination

– Observe the type of lesion:
  - *Macule*: flat, non palpable lesion that is different in colour than the surrounding skin
  - *Papule*: small (< 1 cm) slightly elevated, circumscribed, solid lesion
  - *Vesicle* (< 1 cm), *bulla* (> 1 cm): clear fluid-filled blisters
  - *Pustule*: vesicle containing pus
  - *Nodule*: firm, elevated palpable lesion (> 1 cm) that extend into the dermis or subcutaneous tissue
  - *Erosion*: loss of the epidermis that heals without leaving a scar
  - *Excoriation*: erosion caused by scratching
  - *Ulcer*: loss of the epidermis and at least part of the dermis that leaves a scar
  - *Scale*: flake of epidermis that detaches from the skin surface
  - *Crust*: dried serum, blood, or pus on the skin surface
  - *Atrophy*: thinning of the skin
  - *Lichenification*: thickening of the skin with accentuation of normal skin markings
– Look at the distribution of the lesions over the body; observe their arrangement: isolated, clustered, linear, annular (in a ring). Ask if the lesions are itchy.
– Look for a possible cause: insect bites; scabies, lice, other parasitic skin infections; contact with plants, animals, jewellery, detergents, etc.
– Ask about any ongoing treatment: topical, oral or parenteral.
– Look for local or regional signs (secondary infection, lymphangitis, adenopathy, erysipelas) and/or systemic signs (fever, septicaemia, distant infectious focus).
– Consider the sanitary condition of the family, particularly for contagious skin diseases (scabies, scalp ringworm, lice).
– Check tetanus vaccination status.

Patients with skin disease often present late. At this stage, primary lesions and specific signs may be masked by secondary infection. In these cases, it is necessary to re-examine the patient, after treating the secondary infection, in order to identify and treat the underlying skin disease..

Scabies

Scabies is a cutaneous parasitosis due to the presence of the mite *Sarcoptes scabiei hominis* within the epidermis. It exists in two forms: ordinary scabies, relatively benign and moderately contagious; and crusted scabies, favoured by immune deficiency, extremely contagious and refractory to conventional treatment. Person to person transmission takes place chiefly through direct skin contact, and sometimes by indirect contact (sharing clothing, bedding). The challenge in management is that it must include simultaneous treatment of both the patient and close contacts, and at the same time, decontamination of clothing and bedding of all persons undergoing treatment, in order to break the transmission cycle.

Clinical features

Ordinary scabies

In older children and adults

– Itching, worse at night, very suggestive of scabies if close contacts have the same symptom and
– Typical skin lesions:
  • Scabies burrows (common): fine wavy lines of 5 to 15 mm, corresponding to the tunnels made by the parasite within the skin. Burrows are most often seen in the interdigital spaces of the hand and flexor aspect of the wrist, but may be present on the areolae, buttocks, elbows, axillae. The back and the face are spared. Burrows may be associated with vesicles, corresponding to the entry point of the parasite in the skin.
  • Scabies nodules (less common): reddish-brown nodules, measuring 2 to 20 mm, on the genitals in men, persisting after effective treatment (they are not necessarily indicative of active infection).

and/or

– Secondary skin lesions: resulting from scratching (excoriations, crusts) or super-infection (impetigo).

Typical lesions and secondary lesions may co-exist, or specific lesions may be entirely masked by secondary lesions.

In infants and young children

– Vesicular eruption; often involving palms and soles, back, face, and limbs. Secondary infection or eczematisation is frequent. Isolated scabies nodules in the axillae may be the only manifestation.
– Examination of the mother's hands may support the diagnosis.

Crusted (Norwegian) scabies

Thick, scaly, erythematous plaques, generalised or localised, resembling psoriasis, with or without itching (50% of cases). Delay in diagnosis may lead to a scabies epidemic.

Treatment

In all cases

– Close contacts of the patient are treated simultaneously, even in the absence of symptoms.
– Clothing and bedding (including that of contacts) are changed after each treatment. They are washed at ≥ 60°C then dried in the sun, or exposed to sunlight for 72 hours, or sealed in a plastic bag for 72 hours.

Ordinary scabies

Topical treatment

Topical scabicides are applied over the entire body (including the scalp, post-auricular areas, umbilicus, palms and soles), avoiding mucous membranes and face, and the breasts in breastfeeding women. Particular attention should be paid to common infestation sites. The recommended contact time should not be shortened or exceeded; the patient must not wash his hands while the product is in use (or the product should be reapplied if the hands are washed). In infants, the hands must be wrapped to prevent accidental ingestion of the product. Topical scabicides should not be applied to broken or inflamed skin. Treatment of secondary bacterial infection, if present, should be initiated 24 to 48 hours before use of topical scabicides (see Impetigo).

The preferred treatment is **5% permethrin** (lotion or cream):
Child > 2 months and adult: one application, with a contact time of 8 hours, then rinse off. Permethrin is easier to use (no dilution required), and preferred over benzyl benzoate in children, and pregnant/lactating women. One application may be sufficient, but a second application 7 days later reduces the risk of treatment failure.

or, if not available, **benzyl benzoate 25%** lotion:

	Children < 2 years	Children 2-12 years	Children > 12 years and adults
Dilution	Lotion must be diluted before use:		Use undiluted 25% lotion
	1 part 25% lotion + 3 parts water	1 part 25% lotion + 1 part water	
Contact time	12 hours (6 hours for infants < 6 months), then rinse off	24 hours, then rinse off	24 hours, then rinse off

A second application of benzyl benzoate (e.g. after 24 hours, with a rinse between the 2 applications; or two successive applications, 10 minutes apart, when the first application has dried, with a rinse after 24 hours) reduces the risk of treatment failure.
Second applications are not recommended in pregnant women and children < 2 years

Oral treatment

Treatment with **ivermectin** PO (200 micrograms as a single dose) is an alternative: it is more practical than topical treatment (e.g. in the case of an epidemic or for treating contacts) and can be started right away in the case of secondary infection. A single dose may be sufficient; a second dose 7 days later reduces the risk of treatment failure.

Ivermectin is not recommended for children < 15 kg or pregnant women (safety not established)[a].
Administration of ivermectin to patients with loiasis carries a risk of severe neurological complications when significant *Loa loa* microfilaraemia is present (see Filariasis, Chapter 6)[b].

Weight	15 to 24 kg	25 to 35 kg	36 to 50 kg	51 to 65 kg
Ivermectin 3 mg tab	1 tab	2 tab	3 tab	4 tab
Ivermectin 6 mg tab	1/2 tab	1 tab	1 1/2 tab	2 tab

Treatment effectiveness is judged on clinical grounds. Itching may persist for 1 to 3 weeks after elimination of the parasite.

Persistence of typical burrows beyond 3 weeks should lead to suspicion of treatment failure (insufficient treatment, e.g. the scalp was not included in topical treatment or the patient washed his hands during the treatment period), or early re-infestation (contacts and environment not treated). In these cases, patient and contacts should be retreated.

Persistent itching may be due to another condition, initially masked by scabies.

Crusted scabies

Treatment combines simultaneous administration of oral ivermectin and topical scabicide at regular intervals, e.g. every week for 2 to 3 weeks or more, according to severity and clinical response.

Crusts should be softened (salicylic acid ointment) and removed before applying local treatment (otherwise, local treatment is ineffective).

As exfoliated skin scales may spread the parasite, the patient should be isolated during the treatment, staff should use protection (gloves, gowns and hand washing after contact), and environment (bedding, floors and surfaces) should be decontaminated.

[a] Treatment with ivermectin in these patients is reserved for severe cases for which no alternative exists (see crusted scabies).

[b] In areas where loiasis is endemic, certain precautions are recommended before administering ivermectin: e.g. measure the *Loa loa* microfilaraemia, if possible, or ensure that the patient has no history of loiasis (migration of an adult worm under the conjunctiva or transient « Calabar » swellings), nor history of severe adverse reactions following a previous treatment with ivermectin, or if in doubt, use topical treatment in preference to oral.

Lice (pediculosis)

Pediculosis is a benign contagious parasitic infection due to 3 species of lice specific to humans: head lice, body lice and pubic lice. Transmission from person to person occurs through direct or indirect contact.
Body lice are potential vectors of relapsing fever (Chapter 7), typhus (Eruptive rickettsioses, Chapter 7) and trench fever.

Clinical features

- Head lice mainly affect children: itching and scratch marks (nape of neck and around the ears), which may become secondarily infected (impetigo) in prolonged infestation; presence of live lice and/or live (shiny, grey) nits attached to the hair shaft within 5 mm of the scalp.
- Body lice mainly affect populations living under poor conditions (refugees, prisoners, the homeless): itching and scratch marks (back, belt line and armpits), often inflamed and infected; presence of lice and nits in the clothing (parasites are not found on the body).
- Pubic lice are considered to be a sexually transmitted infection (STI): itching and scratch marks (pubic and perianal area), but other hairy areas may also be affected (armpits, thighs, eyelashes); lice and nits at the base of the hair shaft, rarely visible.
- Examine contacts; check for associated systemic infection (body lice) or STI (pubic lice).

Treatment

Head lice

Apply to dry hair **1% permethrin** lotion (leave on for 10 min) or **0.5% malathion** lotion (leave on for 12 hours; 8 hours in children 6 months-2 years). Do not reduce or exceed the recommended duration of treatment. Rinse thoroughly. Decontaminate combs, headwear and bedding (wash ≥ 60°C/30 min, iron or dry in the sun or, if not feasible, seal in a plastic bag for 2 weeks). Treat those contacts with lice and/or live nits, not those with dead nits alone (dull, white, > 1 cm from scalp) as above. It is recommended to repeat the application after 10 days.

Body lice

Mass treatment (outbreakk)

Apply 30 to 60 g (2 to 4 heaped soup spoons) of **0.5% permethrin** powder to the inside of the clothes and underclothes in contact with the skin (front and back, neck and waistline, sleeves and socks) in a fully clothed patient, then rub in the powder by hand. Leave for 12 to 24 hours.
Treat other clothing (including headwear) and bedding in a plastic bag with **0.5% permethrin** powder. Repeat in 8 to 10 days if the infestation persists.

Individual treatment

Disinfection of clothing and bedding as above or as for head lice.

Pubic lice

Shave and/or apply **1% permethrin** lotion to hairy areas (as for head lice). Treat the partner at the same time. Decontaminate clothing and bedding (as for head lice). Repeat the application after 7 days.

Treatment of secondary bacterial infection, if present, should begin 24 to 48 hours before local antiparasitic treatment (see Impetigo); local treatment is applied later when tolerated.

Superficial fungal infections

Superficial fungal infections are benign infections of the skin, scalp and nails caused by *Candida albicans* or dermatophytes.

Clinical features and treatment

Candidiasis

Candidal diaper dermatitis

Erythema of the perianal area with peripheral desquamation and sometimes pustules. Secondary infection may develop.

- Buttocks must be kept clean (ordinary soap and water) and dry.
- Avoid humidity: according to the context, expose the buttocks to air or change diapers more frequently; remove plastic pants.
- Protect the skin with **zinc oxide ointment** if diarrhoea is present.
- If diaper dermatitis is severe and persistent despite these measures, consider an intestinal infection (**nystatin** PO: 400 000 IU/day in 4 divided doses for 20 days).

Other candidiasis

- Candidiasis of skin folds: **miconazole 2%** cream, twice daily for 2 to 4 weeks
- Oral candidiasis: see Stomatitis, Chapter 3.
- Vulvovaginal candidiasis: see Abnormal vaginal discharge, Chapter 9.

Dermatophytoses

Dermatophytes cause various clinical lesions, depending on the anatomic site involved: scalp, glabrous (hairless) skin, folds or nails. See following page.

Dermatophytoses

Anatomic site[a]	Clinical features	Treatment
Scalp Scalp ringworm *Tinea capitis*	Common in children. Depending on the species: • One or more round, scaly, erythematous plaques with the ends of broken hairs. • Inflammation, suppuration, crusting and peripheral lymphadenopathy (kerion). • Permanent hair loss (favus). Some scalp ringworms are contagious: simultaneously examine (and treat) symptomatic contacts.	• Shave or cut hair short on and around the lesions. • Local treatment: 2 times/day, clean with soap and water, dry and apply **miconazole 2%** cream or **Whitfield's ointment** for 2 weeks or longer if necessary. • Administer systemic treatment as local treatment alone does not cure scalp ringworm: **griseofulvin** PO for 6 weeks (up to 8 to 12 weeks) Children ≤ 12 years: 10 to 20 mg/kg/day in 1 or 2 divided doses (max. 500 mg/d) Children > 12 years and adults: 500 mg to 1 g/day in 1 or 2 divided doses or **itraconazole** PO Children: 3 to 5 mg/kg once daily for 4 weeks (max. 200 mg/d) Adults: 200 mg once daily for 2 to 4 weeks • Suppurative lesions: treat superinfection (see Impetigo) before applying local antifungal treatment. • For painful kerion: paracetamol PO. *In pregnant lactating/breastfeeding women*: oral antifungals are contraindicated. Apply a topical treatment (miconazole 2% cream or Whitfield's ointment) to limit the spread of infection until it is possible to treat orally.
Glabrous skin Ringworm of the body *Tinea corporis*	Erythematous, scaly, pruritic macule with a well-demarcated, raised, vesicular border and central healing.	• For non widespread, localised tinea: Local treatment: 2 times/day, clean with soap and water, dry and apply **miconazole 2%** cream or Whitfield's ointment for 2 to 4 weeks or for 2 weeks after clinical resolution. • Reserve oral antifungals for particularly extensive lesions: griseofulvin PO for 4 to 6 weeks or itraconazole for 15 days.
Folds *Tinea pedis* (athlete's foot) *Tinea cruris*	• *Interdigital spaces (Tinea pedis):* Pruritus, fissure and whitish scales in the 3rd and/or 4th interdigital spaces[b]. • *Groin (Tinea cruris):* Circumscribed, pruritic, erythematous plaque, with a pale centre surrounded by vesiculo-pustules, extending outward from the groin.	Topical treatment as above. If oozing lesions, use **miconazole 2%** cream only (do not use Whitfield's ointment).

[a] Dermatophytosis may affect the nails (*Tinea unguium*, onychomycosis). Treatment is prolonged (12 to 18 months with griseofulvin) thus, in practice, difficult. Failures and relapses are frequent.

[b] In candidal intertrigo, lesions are usually located in the 1st and 2nd interdigital spaces..

Bacterial skin infections

Impetigo

– Impetigo is a benign, contagious infection of the epidermis due to group A ß-haemolytic streptococcus and *Staphylococcus aureus*. Co-infection is common. Transmission is by direct contact. Lack of water, and poor hygiene, increase spread.
– Primary infections are most common in children. Secondary infections complicating pre-existing pruritic dermatoses (lice, scabies, eczema, herpes, chickenpox, etc.) are more common in adults.

Clinical features

– Non bullous impetigo (classic form): flaccid vesicle on erythematous skin which becomes pustular and forms a yellowish crust. Different stages o the infection may be present simultaneously. The lesion does not leave a scar. The most common sites of infection are around the nose and mouth, on the limbs or on the scalp.
– Bullous impetigo: large flaccid bullae and erosions of the skin in the ano-genital region in newborns and infants.
– Ecthyma: an ulcerative form of impetigo that leaves scars. This form is most common in the immunocompromised (e.g. HIV infection, malnutrition), diabetics and alcoholics.
– Regardless of the type of impetigo: absence of fever or systemic signs.
– Possible complications:
  • abscess, pyodermitis, cellulitis, lymphangitis, osteomyelitis, septicaemia;
  • acute glomerulonephritis (routinely look for signs of glomerulonephritis).

Treatment

– *Localised non bullous impetigo* (less than 5 lesions in a single skin area):
  • Clean with soap and water and dry before applying mupirocin.
  • Apply **2% mupirocin** ointment 3 times per day for 7 days. Reassess after 3 days. If there is no response, switch to oral antibiotic therapy (see below).
  • Keep fingernails short. Avoid touching the lesions, keep them covered with gauze if possible.
– *Extensive non bullous impetigo* (more than 5 lesions or impetigo involving more than one skin area), bullous impetigo, ecthyma, impetigo with abscess; immunocompromised patient; topical treatment failure:
  • Clean with soap and water and dry 2 to 3 times per day.
  • Keep fingernails short. Avoid touching the lesions, keep them covered with gauze if possible.
  • Incise abscesses if present.
  • Administer oral antibiotic therapy[a]:
    cefalexin PO for 7 days
    Neonates under 7 days: 50 mg/kg/day in 2 divided doses
    Neonates 7 to 28 days: 75 mg/kg/day in 3 divided doses
    Children 1 month to 12 years: 25 to 50 mg/kg/day in 2 divided doses
    Children over 12 years and adults: 2 g/day in 2 divided doses

[a] In penicillin-allergic patients only (résistance to macrolides is common):
azithromycin PO for 3 days (children: 10 mg/kg once daily; adults: 500 mg once daily)
or **erythromycin** PO for 7 days (children: 30 to 50 mg/kg/day in 2 or 3 divided doses; adults: 3 g/day in 3 divided doses)

or **cloxacillin** PO for 7 days
Children over 10 years: 50 mg/kg/day in 3 divided doses
Adults: 3 g/day in 3 divided doses

Note: in newborns with lesions located around the umbilicus, administer cloxacilllin IV (see table page 178, Chapter 7).

– For all patients:
  • Quarantine from school (children can return to school after 24 to 48 hours of antibiotic therapy).
  • Look for and treat any underlying dermatosis: lice, scabies, eczema, herpes, scalp ringworm, or an ENT infection.
  • Trace and treat contacts.
  • Check for proteinuria (use urine dipstick) 3 weeks after the infection.

Furuncles and carbuncles

Necrotising perifollicular infection, usually due to *Staphylococcus aureus*. Risk factors include: nasal carriage of *S. aureus*, maceration, breaks in the skin, poor hygiene; diabetes mellitus, malnutrition, iron deficiency or immunodeficiency.

Clinical features

– Furuncle: red, warm, painful nodule with a central pustule, usually around a hair follicle. It becomes fluctuant, discharges a core of purulent exudate, and leaves a depressed scar. It occurs most frequently on the thighs, groin, buttocks, armpits, neck and back. There is no fever.
– Carbuncle: a cluster of interconnected furuncles, sometimes with fever and peripheral lymphadenopathy. It leaves a depressed scar.

Treatment

– Single furuncle:
  • Clean with soap and water 2 times/day and cover with a dry dressing.
  • Apply warm moist compresses to the furuncle in order to encourage it to drain.
  • After drainage, clean and apply a dry dressing until the lesion has healed.

– Furuncle on the face, multiple furuncles, carbuncles or in immunocompromised patients:
  • Same local care.
  • Add systematically an antibiotic for 7 days[b]:

    cefalexin PO
    Neonates under 7 days: 50 mg/kg/day in 2 divided doses
    Neonates 7 to 28 days: 75 mg/kg/day in 3 divided doses
    Children 1 month to 12 years: 25 to 50 mg/kg/day in 2 divided doses
    Children over 12 years and adults: 2 g/day in 2 divided doses

[b] For penicillin-allergic patients:
clindamycin PO (children: 30 mg/kg/day in 3 divided doses; adults: 1800 mg/day in 3 divided doses)

or **amoxicillin/clavulanic acid** (**co-amoxiclav**) PO
The dose is expressed in amoxicillin:
Children < 40 kg: 45 to 50 mg/kg/day in 2 divided doses (if using formulations in a ratio of 8:1 or 7:1) or in 3 divided doses (if using formulations in a ratio of 4:1)
Children ≥ 40 kg and adults: 1500 to 2000 mg/day depending on the formulation available:
8:1 ratio: 2000 mg/day = 2 tablets of 500/62.5 mg 2 times per day
7:1 ratio: 1750 mg/day = 1 tablet of 875/125 mg 2 times per day
4:1 ratio: 1500 mg/day = 1 tablet of 500/125 mg 3 times per day
The dose of clavulanic acid should not exceed 12.5 mg/kg/day or 375 mg/day.

– In all cases: wash hand frequently, wash bedding.

Erysipelas and cellulitis

Acute skin infections, most often due to Group A beta-haemolytic streptococcus, and at times *Staphylococcus aureus* (including methicillin resistant *S. aureus*–MRSA). Recurrence is common in adults.

Clinical signs

– Skin erythema, oedema with well demarcated margins, warmth, pain, usually on the lower limbs and at times the face.
– Often with fever, lymphadenopathy and lymphangitis.
– Look for a portal of entry (bite, ulcer, wound, intertrigo, eczema, fungal infection, etc.).
– Rarely progression to necrotising fasciitis (Chapter 10).
– Rare systemic complications: septicaemia, acute glomerulonephritis.

Treatment

– In all cases:
  • Outline the area of erythema with a pen in order to follow the infection[c].
  • Bed rest with leg elevated, treatment of pain (Chapter 1).
  • Administer antibiotics: either orally or IV depending on severity.
  • Treat portal of entry.
  • Non-steroidal anti-inflammatory drugs are contra-indicated (risk of necrotizing fasciitis).
  • Test for proteinuria by urine dipstick, 3 weeks after infection in order to detect glomerulonephritis.
  • Tetanus immunisation: see Tetanus (Chapter 7).

– Hospitalize for the following: children younger than 3 months, critically ill appearing patient[d], local complications, debilitated patient (chronic conditions, the elderly) or if there is a risk of non-compliance with or failure of -outpatient treatment. Treat other patients as outpatients.

[c] The erythema will regress if the treatment is effective. If the erythema spreads consider a treatment failure (MRSA or a necrotizing infection).

[d] Critically ill appearing child: weak grunting or crying, drowsy and difficult to arouse, does not smile, disconjugate or anxious gaze, pallor or cyanosis, general hypotonia.

– Outpatient antibiotic therapy[e]:
cefalexin PO for 7 to 10 days
Children 1 month to 12 years: 25 to 50 mg/kg/day in 2 divided doses
Children over 12 years and adults: 2 g/day in 2 divided doses
or
amoxicillin/clavulanic acid (**co-amoxiclav**) PO for 7 to 10 days. The dose is expressed in amoxicillin:
Children < 40 kg: 45 to 50 mg/kg/day in 2 divided doses (if using formulations in a ratio of 8:1 or 7:1) or in 3 divided doses (if using formulations in a ratio of 4:1).
Children ≥ 40 kg and adults: 1500 to 2000 mg/day depending on the formulation available:
8:1 ratio: 2000 mg/day = 2 tablets of 500/62.5 mg 2 times per day
7:1 ratio: 1750 mg/day = 1 tablet of 875/125 mg 2 times per day
4:1 ratio: 1500 mg/day = 1 tablet of 500/125 mg 3 times per day
The dose of clavulanic acid should not exceed 12.5 mg/kg/day or 375 mg/day.

– Inpatient antibiotic therapy[f]:

  • First line therapy:
  cloxacillin IV infusion over 60 minutes[g]
  Children 1 month to 12 years: 50 to 100 mg/kg/day in 4 divided doses
  Children over 12 years and adults: 4 g/day in 4 divided doses
  or
  amoxicillin/clavulanic acid (**co-amoxiclav**) by slow IV injection (3 minutes) or infusion (30 minutes). The dose is expressed in amoxicillin:
  Children: 80 to 100 mg/kg/day in 3 divided doses
  Adults: 3 g/day in 3 divided doses
  If there is clinical improvement after 48 hours (afebrile and erythema and oedema have improved) switch to cefalexin or amoxicillin/clavulanic acid PO at the doses indicated above to complete 7 to 10 days of treatment.

  • If there is no clinical improvement after 48 hours, consider MRSA:
  clindamycin IV infusion over 30 minutes[h]
  Children 1 month and over: 30 mg/kg/day in 3 divided doses
  Adults: 1800 mg/day in 3 divided doses
  After 48 hours, change to clindamycin PO at the doses indicated above to complete 7 to 10 days of treatment.

  • In case of necrotizing fasciitis: urgent transfer to a surgical centre, initiate antibiotic therapy while awaiting transfer.

[e] For penicillin-allergic patients, **clindamycin** PO for 7 to 10 days:
Children: 30 mg/kg/day in 3 divided doses; adults: 1800 mg/day in 3 divided doses

[f] For penicillin-allergic patients, **clindamycin** IV infusion (doses as above).

[g] Cloxacillin powder for injection should be reconstituted in 4 ml of water for injection. Then dilute each dose of cloxacillin in 5 ml/kg of 0.9% sodium chloride or 5% glucose in children less than 20 kg and in a bag of 100 ml of 0.9% sodium chloride or 5% glucose in children over 20 kg and in adults.

[h] Dilute each dose of clindamycin in 5 ml/kg of 0.9% sodium chloride or 5% glucose in children less than 20 kg and in a bag of 100 ml of 0.9% sodium chloride or 5% glucose in children over 20 kg and in adults.

Cutaneous anthrax

– Anthrax is caused by the bacterium *Bacillus anthracis* that primarily affects herbivores (sheep, goats, cows, camels, horses, etc.). Humans may become infected through contact of broken skin with a dead or sick animal. People at risk include livestock farmers and those that manipulate skins, wool or carcasses of infected animals.
– The disease is found in Eastern Europe, Central Asia, the Mediterranean Basin, Africa and South America.
– Pulmonary (acquired by inhalation) and intestinal (acquired by eating infected meat) forms also exist.

Clinical features

– Papule, then pruritic vesicle on uncovered skin surfaces (face, neck, arms, legs). The vesicle ulcerates and becomes a painless black eschar surrounded by oedema, often associated with with lymphangitis and regional lymphadenopathy.
– The following are criteria of severity:
  • Lesion located on the head or neck, or
  • Presence of systemic symptoms (fever, malaise, headache, tachycardia, tachypnoea, hypotension, hyper/hypothermia), or
  • Presence of extensive oedema, or
  • Multiple, extensive or bullous lesions.

Laboratory

– From vesicular fluid[a]: culture and susceptibility testing (rarely available) or Gram stain for microscopic examination.
– PCR testing (reference laboratory).

Treatment

Cutaneous anthrax without severity criteria

– Do not excise the eschar; daily dry dressings.
– Antibiotic therapy for 7 to 10 days:
  • If drug susceptibility is not known:
  ciprofloxacin PO is first-line treatment for all patients including pregnant women and children:
  Children: 30 mg/kg/day in 2 divided doses (max. 1 g/day)
  Adults: 1 g/day in 2 divided doses
  Alternatives include:
  doxycycline PO (except in pregnant or lactating women and children less than 8 years)
  Children 8 to 12 years: 100 mg/day in 2 divided doses
  Children over 12 years and adults: 200 mg/day in 2 divided doses
  or
  clindamycin PO (e.g. in pregnant or lactating women and children less than 8 years)
  Children: 30 mg/kg/day in 3 divided doses (max. 1800 mg/day)
  Adults: 1800 mg/day in 3 divided doses

[a] Samples can be stored (including transport time) for 7 days max. in cold chain (if not available, at a temperature < 30°C).

- If penicillins are effective (documented susceptibility):
  amoxicillin PO
  Children: 100 mg/kg/day in 3 divided doses
  Adults: 3 g/day in 3 divided doses

Severe cutaneous anthrax

– Combination antibiotic therapy for 14 days:

⚠ Whatever the protocol used, do not mix the two drugs in the same infusion bag (incompatibility).

- If drug susceptibility is not known:
  ciprofloxacin IV infusion over 60 minutes[b]
  Children: 30 mg/kg/day in 3 divided doses
  Adults: 1200 mg/ day in 3 divided doses
  +
  clindamycin IV infusion over 30 minutes[b]
  Children 1 month and over: 40 mg/kg/day in 3 divided doses (max. 2700 mg/day)
  Adults: 2700 mg/day in 3 divided doses
- If penicillins are effective (documented susceptibility):
  ampicillin IV
  Children 1 month and over: 200 mg/kg/day in 3 divided doses
  Adults: 12 g/day in 3 divided doses
  +
  clindamycin IV infusion as above.

Change to oral treatment as soon as possible to complete 14 days of treatment with ciprofloxacin + clindamycin or amoxicillin + clindamycin as for cutaneous anthrax without severity criteria.

– Intensive care: symptomatic treatment of shock (see Shock, Chapter 1); tracheostomy and ventilatory support may be necessary.

Prevention

– Antibiotic prophylaxis in case of known skin exposure: treat for 10 days PO as for cutaneous anthrax without severity criteria.
– Livestock vaccination; burial or burning of animal carcasses.

[b] Dilute each dose of ciprofloxacin or clindamycin in 5 ml/kg of 0.9% sodium chloride or 5% glucose in children less than 20 kg and in a bag of 100 ml of 0.9% sodium chloride or 5% glucose in children above 20 kg and in adults. Administer ciprofloxacin more slowly than clindamycin.

Endemic treponematoses

Endemic treponematoses are bacterial infections caused by 3 different types of treponema (other than *Treponema pallidum*). Human-to-human transmission may be direct or indirect.

The 3 endemic treponematoses result in positive syphilis serology (TPHA-VDRL), but these tests are not necessary as diagnosis is clinical. There is no laboratory test that can distinguish between the different treponematoses.

For the diagnosis and treatment of syphilis, see Genital infections, Chapter 9.

Clinical features

See table following page.

Treatment

Yaws

azithromycin PO
Children and adults: 30 mg/kg as a single dose (maximum 2 g)
or
benzathine benzylpenicillin IM
Children under 30 kg (or under 10 years): 600 000 IU as a single dose
Children 30 kg and over (or 10 years and over) and adults: 1.2 MIU as a single dose

Pinta and bejel

benzathine benzylpenicillin IM
Children under 30 kg (or under 10 years): 600 000 IU as a single dose
Children 30 kg and over (or 10 years and over) and adults: 1.2 MIU as a single dose

For patients allergic to penicillin:
erythromycin PO
Children: 50 mg/kg/day in 2 or 3 divided doses for 14 days
Adults: 2 to 3 g/day in 2 or 3 divided doses for 14 days
or
doxycycline PO (except for children under 8 years and pregnant and lactating women)
Children over 8 years: 100 to 200 mg once daily or in 2 divided doses for 14 days
Adults: 200 mg once daily or in 2 divided doses for 14 days

Notes:
- Antibiotic treatment will cure early stage cases and may relieve the pain of osteitis. It may be ineffective for late stage infections.
- Syphilis serology will remain positive despite clinical cure.

Treatment of contacts and latent cases

The same treatment should be administered to all symptomatic and asymptomatic contacts and to all latent cases (asymptomatic individuals with positive serologic test for syphilis) in endemic zones.

	Yaws	Pinta	Bejel
Pathogen	*Treponema pertenue*	*Treponema carateum*	*Treponema pallidum* type M
Geographic distribution	Tropical and humid forests	Tropical zones of Latin America	Arid areas, semi-desert of the Middle East and Africa
Population	Children between 4 and 14 years	Children and adults	Nomadic populations, particularly children
First stage	Yaws chancre: skin coloured lesion, non-indurated, itchy, on the lower limbs in 95% of cases, with peripheral adenopathy. Spontaneous healing or development of a large yaw surrounded by smaller yaws.	Annular, erythematous, scaly plaques, usually on uncovered body parts (face, extremities), resemble dermatophytes. Lesions heal spontaneously leaving scars.	Discrete chancre: moist papule, most commonly on the mucous membranes or in dermal folds, with peripheral adenopathy.
Second stage	Lesions appear 3 weeks after the initial chancre, occur in crops and heal spontaneously: • Frambesioma (papillomatous lesion, vegetal, very contagious) • Isolated or associated with yaws (round, squamous papules, not very contagious) • Osteoperiostitis of the long bones (phalanges, nasal process of the maxilla, tibia)	Pintids: plaques of various colours (bluish, reddish, whitish). May occur anywhere on the body.	• Mucous patches of the mouth common: very contagious ulcerated, round in form, indurated, with white coating, bleed easily, usually occur on the inside of the lips, cheek and tongue or labial folds • Condyloma in the anogenital region (rare) • Cutaneous lesions are rare: vegetal aspect, in dermal folds • Bone destruction identical to that of yaws, in the legs and forearms
Late stage	After some years of latency: • Periostitis; painful, debilitating osteitis • Ulcerating and disfiguring rhinopharyngitis • Juxta-articular nodules	Symmetrical white patches on the limbs. The depigmentation is permanent, remaining after treatment.	After several years of latency: • Gummatous lesions of skin and long bones • Plantar and palmar keratosis • Juxta-articular nodules • Hyper- and hypo-pigmented patches (as in pinta)

Leprosy (Hansen's disease)

An endemic, chronic bacterial infection due to *Mycobacterium leprae*. Humans are the only reservoir of proven significance. Leprosy is not very contagious with transmission through prolonged, close, direct contact, particularly between household members. Children are most at risk of contracting the disease.

Clinical features

Leprosy should be considered in any patient presenting with hypopigmented skin lesions or peripheral neuropathy. In suspect cases, conduct a thorough clinical examination:
– skin and mucous membranes (patient must be undressed),
– neurological examination: sensitivity to light touch, pinprick and temperature (hot-cold test),
– palpation of the peripheral nerves.

Different clinical forms and classification of leprosy exist.
The Ridley-Jopling classification differentiates 5 forms based on several factors, including the bacteriological index.
The WHO clinical classification is simplified to include only 3 forms (see next page).

The Ridley-Jopling classification of leprosy

Paucibacillary forms (least contagious forms)			**Multibacillary forms** (most contagious forms))	
Tuberculoid	Borderline Tuberculoid	Borderline	Borderline Lepromatous	Lepromatous
T.T.	B.T.	B.B.	B.L.	L.L.

Tuberculoid leprosy

– The primary characteristic is peripheral nerve involvement: tender, infiltrated and thickened nerves; loss of thermal, then tactile and pain sensation. This may lead to trophic ulcers and mutilations of the extremities.
– Lesions are single or few in number:
  • plaque with a well-demarcated raised border and an atrophic, clear centre,
  or
  • erythematous macule on pale skin, hypopigmented macule on dark skin.
– Nerve involvement develops late in the disease.

Lepromatous leprosy

– The primary characteristic is multiple muco-cutaneous lesions:
  • macules, papules or infiltrated nodules on the face, ear lobes and the upper and lower limbs. Lesions are bilateral, symmetrical, pigmented. Initially, there is no sensory loss;
  • involvement of the nasal mucosa with crusting and nose bleeds;
  • oedema of the lower limbs.
– Nerve involvement develops late in the disease.

Borderline leprosy

Forms between tuberculoid and lepromatous.

Indeterminate leprosy (I)

Form that does not fall in the Ridley-Jopling classification, frequent in children: a single well-demarcated macule, hypopigmented on dark skin, slightly erythematous on pale skin. Absence of sweat and hair, and loss of sensation are inconstant.
Lesion heals spontaneously or the disease evolves towards tuberculoid or lepromatous leprosy.

Lepra reactions

- *Reversal reactions*: occur in patients with borderline leprosy, during treatment, when evolving towards tuberculoid leprosy. Skin lesions become swollen and painful with a risk of necrosis and ulceration. Acute painful neuritis (ulnar nerve) requires urgent treatment (see next page) as there is a risk of permanent sequelae.
- *Downgrading reactions*: occur in untreated patients with borderline leprosy, when the disease evolves towards lepromatous leprosy. These reactions are difficult to distinguish from reversal reactions.
- *Erythema nodosum leprosum*: crops of tender subcutaneous nodules, purplish-red, then yellowish in colour. This reaction is seen exclusively in patients with lepromatous leprosy during the first year of treatment.

In order to simplify diagnosis and to promote rapid implementation of treatment, the WHO simplified clinical classification of leprosy and differentiates only 3 forms:
- Multibacillary leprosy: more than 5 skin lesions
- Paucibacillary leprosy: 2 to 5 skin lesions
- Single skin lesion paucibacillary leprosy

Laboratory

Demonstration of acid-fast bacilli in a Ziehl-Neelsen stained smear:
- nasal smear,
- skin-split smear taken from the ear lobe or from a skin lesion.

In tuberculoid leprosy, bacilli are usually not found.

Treatment

Treatment of leprosy

- Leprosy is a curable disease. Early antibiotic treatment prevents functional sequelae and transmission of the disease.
- In countries where leprosy is endemic, it is important to be informed about national control programmes.
- The high rates of resistance and of recurrences after single drug therapy have led to the use of effective multi-drug therapy regimens which are easy to administer in the field and for which no resistance has been reported.
- Teach the patient to recognise and quickly report a lepra reaction or relapse in order to modify or restart treatment.

Treatment recommended by the WHO, based on the simplified clinical classification of leprosy

	Multibacillary leprosy (more than 5 skin lesions)	Paucibacillary leprosy (2 to 5 skin lesions)	Paucibacillary leprosy (single skin lesion)
Children under 10 years	**dapsone** PO: 25 mg once daily, self-administered + **rifampicin** PO: 300 mg once monthly, under supervision + **clofazimine** PO: 100 mg once monthly, under supervision and 50 mg 2 times weekly, self-administered	**dapsone** PO: 25 mg once daily, self-administered + **rifampicin** PO: 300 mg once monthly, under supervision	
Children between 10 and 14 years	**dapsone** PO: 50 mg once daily, self-administered + **rifampicin** PO: 450 mg once monthly, under supervision + **clofazimine** PO: 150 mg once monthly, under supervision and 50 mg on alternate days, self-administered	**dapsone** PO: 50 mg once daily, self-administered + **rifampicin** PO: 450 mg once monthly, under supervision	
Adults	**dapsone** PO: 100 mg once daily, self-administered + **rifampicin** PO: 600 mg once monthly, under supervision + **clofazimine** PO: 300 mg once monthly, under supervision and 50 mg once daily, self-administered	**dapsone** PO: 100 mg once daily, self-administered + **rifampicin** PO: 600 mg once monthly, under supervision	**rifampicin** PO: 600 mg + **ofloxacin** PO: 400 mg + **minocycline** PO: 100 mg
Duration	12 months	6 months	single dose

Treatment of leprosy reactions

– Reversal or downgrading reactions
prednisolone (or **prednisone**) PO: 1 mg/kg/day for 3 to 5 days then progressively decrease the dosage (reduce the dosage by 10% each week).

– Erythema nodosum leprosum
clofazimine PO: 100 to 300 mg/day associated with an NSAID (do not administer dosages equal to or greater than 300 mg/day for more than 3 months).

Herpes simplex and herpes zoster

Herpes simplex

Recurrent viral infection of the skin and mucous membranes due to the *Herpes simplex virus*. Recurrent lesions have a different presentation than primary infection.

Clinical features

- Recurrent herpes labialis: tingling feeling followed by an eruption of vesicles on an erythematous base, located on the lips ('fever blisters') and around the mouth, they may extend onto the face. Recurrence corresponds to a reactivation of the latent virus after a primary infection. No associated malaise, adenopathy or fever.
- Carefully consider other sites: buccal (Stomatitis, Chapter 3), genital (Genital ulcers, Chapter 9), ophthalmic, and secondary bacterial infections.

Treatment

- Clean with soap and water 2 times/day until the lesions have healed.
- For patients with secondary bacterial infections: antibiotic treatment as for impetigo.

Herpes zoster (shingles)

Acute viral infection due to the varicella-zoster virus. Chickenpox is the primary infection and herpes zoster the reactivation of the latent virus.

Clinical features

- Unilateral neuralgic pain followed by an eruption of vesicles on a erythematous base, that follow the distribution of a nerve pathway.
- Lesions most commonly occur on the thorax, but herpes zoster may also develop on the face with a risk of ophthalmic complications.
- Herpes zoster is more common in adults than in children.

Treatment

- Similar to that of herpes simplex, with the addition of systematic analgesics: paracetamol PO (see Pain, Chapter 1).
- Aciclovir PO given within the first 48 hours after the eruption of lesions is only indicated for severe forms: necrotic or extensive lesions or lesion on the face which may spread to the eyes (see HIV infection and AIDS, page 232, Chapter 8).

Other skin disorders

Eczema (dermatitis)

– Acute eczema: erythematous plaque, pruritic, vesicular, oozing, with poorly demarcated and crumbly borders.
– Chronic eczema: erythematous plaque, scaly, dry, poorly demarcated and pruritic.
– Look for a cause (contact allergic dermatitis, fungal or bacterial infection with a distant focus, malnutrition) and ask about family history.

Treatment

– Clean with soap and water 2 times/day.
– Then apply:
  • for acute eczema: **calamine** lotion 2 times/day
  • for chronic eczema: **zinc oxide** ointment 2 times/day
– Look for and treat any pre-existing skin disease (scabies, lice etc.).
– For patients with secondary infections: treat as impetigo.
– For patients with intense pruritus, antihistamines (chlorphenamine or promethazine PO at the dosages indicated following page) for a few days.

Seborrheic dermatitis

Seborrheic dermatitis is an inflammatory chronic dermatosis that can be localized on rich areas rich with sebaceous glands. This dermatosis is more common in infected patients with HIV.

Clinical features

– Erythematous plaques covered by greasy yellow scales that can be localized on the scalp, the face (nose wings, eyebrows, edge of the eyelids), sternum, spine, perineum, and skin folds.

Treatment

– Clean with soap and water 2 times /day; shampooing the scalp.
– **Hydrocortisone 1%**: 1 to 2 applications/day in a thin layer, for 7 days maximum
– Do not apply if pre-existing bacterial infection; treat first the infection (see Impetigo).

Urticaria

– Papules: transient, erythematous, oedematous, pruritic, resembling nettle stings.
– Look for a cause: food or drug (particularly antibiotic) allergy, insect bites; the invasive stage of a bacterial or parasitic infection (ascariasis, strongylodiasis, ancylostomiasis, schistosomiasis, loiasis), viral infection (hepatitis B or C); generalised disease (cancer, lupus, dysthyroidism, vasculitis).

Treatment

– If the pruritus is intense, antihistamines:
chlorphenamine PO
Children from 1 to 2 years: 1 mg 2 times daily
Children from 2 to 6 years: 1 mg 4 to 6 times daily (max. 6 mg/day)
Children from 6 to 12 years: 2 mg 4 to 6 times daily (max. 12 mg/day)
Children over 12 years and adults: 4 mg 4 to 6 times daily (max. 24 mg/day)
or, if not available,
promethazine PO
Children from 2 to 5 years: 10 mg/day in 2 divided doses
Children from 5 to 10 years: 10 to 25 mg/day in 2 divided doses
Children over 10 years and adults: 75 mg/day in 3 divided doses
– In the event of anaphylactic reaction, see Shock (Chapter 1).

Pellagra

Pellagra is a dermatitis resulting from niacin and/or tryptophane deficiency (in persons whose staple food is sorghum; patients with malabsorption, or during famine).

Clinical features

Classically, disease of the ‘three Ds’: dermatitis, diarrhoea and dementia.
– Dark red plaques, well demarcated, symmetric, located on exposed areas of the body (forehead, neck, forearms, legs). The skin becomes very scaly, pigmented, sometimes with haemorrhagic bullae.
– Gastrointestinal (glossitis, stomatitis and diarrhoea) and neuropsychiatric symptoms are seen in more serious forms.

Treatment

– **nicotinamide** (**vitamin PP**) PO
Children and adults: 300 to 500 mg/day in 2 divided doses, give with a diet rich in protein until the patient is fully cured.
– In the event of an epidemic of pellagra, for example in a refugee camp, it is vital that the food ration be modified (add groundnuts or dry vegetables) in order to meet the daily requirements (approximately 15 mg/day for adults).

Chapter 5: Eye diseases

Xerophthalmia (vitamin A deficiency)

Conjunctivitis
- *Neonatal conjunctivitis*
- *Viral epidemic keratoconjunctivitis*

Trachoma

Periorbital and orbital cellulitis

Other pathologies
- *Onchocerciasis*
- *Loiasis*
- *Pterygium*
- *Cataract*

Xerophthalmia (vitamin A deficiency)

The term xerophthalmia covers all the ocular manifestations of vitamin A deficiency. Xerophthalmia can progress to irreversible blindness if left untreated.

In endemic areas, vitamin A deficiency and xerophthalmia affect mainly children (particularly those suffering from malnutrition or measles) and pregnant women.

Disorders due to vitamin A deficiency can be prevented by the routine administration of retinol.

Clinical features

– The first sign is hemeralopia (crepuscular blindness): the child cannot see in dim light, may bump into objects and/or show decreased mobility.

– Then, other signs appear gradually:
  • Conjunctival xerosis: bulbar conjunctiva appears dry, dull, thick, wrinkled and insensitive
  • Bitot's spots: greyish foamy patches on the bulbar conjunctiva, usually in both eyes (specific sign, however not always present).
  • Corneal xerosis: cornea appears dry and dull
  • Corneal ulcerations
  • Keratomalacia (the last and most severe sign of xerophthalmia): softening of the cornea, followed by perforation of the eyeball and blindness (extreme care must be taken during ophthalmic examination due to risk of rupturing cornea).

Treatment

It is essential to recognise and treat early symptoms to avoid the development of severe complications. Vision can be saved provided that ulcerations affect less than a third of the cornea and the pupil is spared. Even if deficiency has already led to keratomalacia and irreversible loss of sight, it is imperative to administer treatment, in order to save the other eye and the life of the patient.

– **Retinol** (**vitamin A**) PO

  Regardless of the clinical stage:
  Children from 6 to 12 months (or under 8 kg): 100 000 IU once daily on D1, D2 and D8
  Children over 1 year (or over 8 kg): 200 000 IU once daily on D1, D2 and D8
  Adults (except pregnant women): 200 000 IU once daily on D1, D2 and D8
  Vitamin A deficiency is rare in breast fed infants under 6 months, if needed: 50 000 IU once daily on D1, D2 and D8.

  In pregnant women, treatment varies according to the stage of illness:
  • Hemeralopia or Bitot's spots: 10 000 IU once daily or 25 000 IU once weekly for at least 4 weeks. Do not exceed indicated doses (risk of foetal malformations).
  • If the cornea is affected, risk of blindness outweighs teratogenic risk. Administer 200 000 IU once daily on D1, D2 and D8.

– Corneal lesions are a medical emergency. In addition to the immediate administration of retinol, treat or prevent secondary bacterial infections: apply **1% tetracycline eye ointment** twice daily (do not apply eye drops containing corticosteroids) and protect the eye with an eye-pad after each application.

Prevention

– Systematically administer retinol PO to children suffering from measles (one dose on D1 and D2).

– In areas where vitamin A deficiency is common, routine supplementation of **retinol** PO:
Children under 6 months: 50 000 IU as a single dose
Children from 6 to 12 months: 100 000 IU as a single dose every 4 to 6 months
Children from 1 to 5 years: 200 000 IU as a single dose every 4 to 6 months
Mothers after giving birth: 200 000 IU as a single dose immediately after delivery or within 8 weeks of delivery

Note: to avoid excessive dosage, record any doses administered on the health/ immunisation card and do not exceed indicated doses. Vitamin A overdose may cause raised intracranial pressure (bulging fontanelle in infants; headache, nausea, vomiting) and, in severe cases, impaired consciousness and convulsions. These adverse effects are transient; they require medical surveillance and symptomatic treatment if needed.

Conjunctivitis

Conjunctivitis is an acute inflammation of the conjunctiva due to a bacterial or viral infection, allergy, or irritation. Endemic or epidemic, conjunctivitis may be associated with measles or rhinopharyngitis in children. In the absence of hygiene and effective treatment, secondary bacterial infections may develop, affecting the cornea (keratitis) and leading to blindness.

Clinical features

- Clinical signs of all conjuctivites include: redness of the eye and irritation. Visual acuity is not affected.
- Depending on the cause:
  - abundant and purulent secretions, eyelids stuck together on waking, unilateral infection at onset: bacterial conjunctivitis;
  - watery (serous) secretions, no itching: viral conjunctivitis;
  - excessive lacrimation, eyelid oedema, intense itching: allergic conjunctivitis.
- In endemic areas, turn both upper eyelids up to check for signs of trachoma (see Trachoma).
- Suspect keratitis if patient reports intense pain (more than is usually associated with conjunctivitis) and photophobia. Instill one drop of **0.5% fluorescein** to check for possible ulcerations.
- Always check for foreign bodies (subconjunctival or corneal) and remove after administering **0.4% oxybuprocaine** anaesthetic eye drops. Never give bottle of eye drops to the patient.

Treatment

Bacterial conjunctivitis

- Clean eyes 4 to 6 times/day with boiled water or 0.9% sodium chloride.
- Apply **1% tetracycline eye ointment** 2 times/day into both eyes for 7 days.
- Never use corticosteroid drops or ointment.

Viral conjunctivitis

- Clean eyes 4 to 6 times/day with boiled water or 0.9% sodium chloride.
- Apply local antibiotics if there is a (risk of) secondary bacterial infection (see above).

Allergic conjunctivitis

- Local treatment as for viral conjunctivitis.
- Antihistamines for one to 3 days: chlorphenamine or promethazine PO (see Urticaria, Chapter 4).

Note: in the event of a foreign body, check tetanus immunisation status.

Neonatal conjunctivitis

Conjunctivitis due to *Neisseria gonorrhoeae* and/or *Chlamydia trachomatis* in children born to infected mothers.

Clinical features

- Purulent conjunctivitis within the first 28 days of life.
- *Gonococcal conjunctivitis* usually occurs 2 to 7 days after birth. The infection is bilateral in 50% of cases, highly contagious and may rapidly lead to severe corneal lesions and blindness.
- *Chlamydial conjunctivitis* usually occurs 5 to 14 days after birth. The infection is often unilateral.

Prevention

Immediately at birth:

- Clean eyelids with sterile 0.9% sodium chloride.
- Then, apply **1% tetracycline eye ointment** once into both eyes.

Note:
In case of maternal herpes simplex virus infection at delivery: clean eyelids with sterile 0.9% sodium chloride then, apply **3% aciclovir eye ointment** once into both eyes, then wait 12 hours and apply tetracycline.

Treatment

At dispensary level

Treatment is urgent and the child should be referred. When immediate hospitalisation is not possible, clean and apply **1% tetracycline eye ointment** into both eyes every hour, until systemic treatment is available.

At hospital level

- If possible isolate the newborn for 24 to 48 hours.
- Treatment of choice is **ceftriaxone** IM: 50 mg/kg as a single dose (without exceeding 125 mg) if only the eyes are infected.
  If ceftriaxone is not available or contraindicated, use **cefotaxime** IM: 100 mg/kg as a single dose.
- Clean eyes with an isotonic sterile solution (0.9% sodium chloride or Ringer Lactate) to prevent secretions from adhering, and apply **1% tetracycline eye ointment** 4 times/day.
- If systemic treatment is not immediately available, apply **1% tetracycline eye ointment** into both eyes every hour until the treatment is available.
- Treat mother and partner (Genital infections, Chapter 9).

– If symptoms persist 48 hours after the injection of ceftriaxone or appear after 7 days of life, add **erythromycin** PO: 25 to 50 mg/kg/day in 4 divided doses for 14 days.
Azithromycin PO, 20 mg/kg once daily for 3 days, may be an alternative if treatment with erythromycin is difficult to achieve.

Viral epidemic keratoconjunctivitis

(corneal and conjunctival lesions)

– Treat as viral conjunctivitis. If possible, refer to an ophthalmologist.
– Protect the eye with a compress as long as photophobia lasts. Remove as soon as possible.
– If necessary, administer a preventive dose of **vitamin A** (see page 128).

Trachoma

Trachoma is a highly contagious keratoconjunctivitis due to *Chlamydia trachomatis*. The disease is endemic in the poorest rural areas of Africa, Asia, Central and South America and the Middle East.

Infection is usually first contracted early in childhood by direct or indirect contact (dirty hands, contaminated towels, flies). In the absence of hygiene and effective treatment, the inflammation intensifies with successive infections, causing scars and deformities on the upper tarsal conjunctiva. The resulting ingrowing eyelashes (trichiasis) cause corneal lesions followed by permanent blindness, usually in adulthood.

The WHO classifies trachoma into 5 stages. Early diagnosis and treatment of first stages is essential to avoid the development of trichiasis and associated complications.

Clinical features

Several stages can occur simultaneously:

– Stage I: trachomatous inflammation - follicular (TF)
  Presence of five or more follicles in the upper tarsal conjunctiva. Follicles are whitish, grey or yellow elevations, paler than the surrounding conjunctiva.
– Stage II: trachomatous inflammation - intense (TI)
  The upper tarsal conjunctiva is red, rough and thickened. The blood vessels, normally visible, are masked by a diffuse inflammatory infiltration or follicles.
– Stage III: trachomatous scarring (TS)
  Follicles disappear, leaving scars: scars are white lines, bands or patches in the tarsal conjunctiva.
– Stage IV: trachomatous trichiasis (TT)
  Due to multiple scars, the margin of the eyelid turns inwards (entropion); the eyelashes rub the cornea and cause ulcerations and chronic inflammation.
– Stage V: corneal opacity (CO)
  Cornea gradually loses its transparency, leading to visual impairment and blindness.

Treatment

– Stages I and II:
  • Clean eyes and face several times per day.
  • Antibiotic therapy:
    The treatment of choice is **azithromycin** PO:
    Children over 6 months or over 6 kg: 20 mg/kg as a single dose
    Adults: 1 g as a single dose
    Failing the above, apply **1% tetracycline eye ointment**: 2 times/day for 6 weeks
    In children under 6 months or 6 kg: **erythromycin** PO (40 mg/kg/day in 2 divided doses for 14 days)

– Stage III: no treatment

– Stage IV: surgical treatment
  While waiting for surgery, if regular patient follow-up is possible, taping eyelashes to the eyelid is a palliative measure that can help protect the cornea. In certain cases, this may lead to permanent correction of the trichiasis within a few months.
  The method consists in sticking the ingrowing eyelashes to the external eyelid with thin strip of sticking-plaster, making sure that the eyelid can open and close perfectly. Replace the plaster when it starts to peel off (usually once a week); continue treatment for 3 months.
  Note: epilation of ingrowing eyelashes is not recommended since it offers only temporary relief and regrowing eyelashes are more abrasive to the cornea.

– Stage V: no treatment

Prevention

Cleaning of the eyes, face and hands with clean water reduces direct transmission and the development of secondary bacterial infections.

Periorbital and orbital cellulitis

– Periorbital cellulitis is a common, usually benign, bacterial infection of the eyelids. It arises principally following trauma to the eyelids (insect bite or abrasion).
– Orbital cellulitis is a serious infection involving the contents of the orbit (fat and ocular muscles) that may lead to loss of vision or a brain abscess. It usually arises secondary to spread from sinusitis (e.g. as a complication of ethmoid sinusitis).
– Periorbital and orbital cellulitis are more common in children than in adults.
– The most common organisms causing periorbital and orbital cellulitis are *Staphylococcus aureus*, *Streptococcus pneumoniae* and other streptococci, as well as *Haemophilus influenzae type b* in children living in countries where rates of immunisation with Hib remain low.

Clinical features

– Signs common to both periorbital and orbital cellulitis: acute eyelid erythema and oedema; the oedema has a violaceous hue if secondary to *H. influenzae*.
– In case of orbital cellulitis only:
  • Pain with eye movements;
  • Ophthalmoplegia (paralysis of eye movements) often with diplopia (double vision);
  • Protrusion of the eye;
  • High fever, systemic signs.

Treatment

– Hospitalize for the following: orbital cellulitis, children younger than 3 months, critically ill appearing patient[a], local complications, debilitated patient (chronic conditions, the elderly), if there is a risk of non-compliance with or failure of outpatient treatment. Treat the other patients as outpatients.
– Outpatient antibiotic therapy[b]:
  cefalexin PO for 7 to 10 days
  Neonates 0 to 7 days: 50 mg/kg/day in 2 divided doses
  Neonates 8 days to 1 month: 75 mg/kg/day in 3 divided doses
  Children over 1 month: 25 to 50 mg/kg/day in 2 divided doses (max. 2 g/day)
  Children ≥ 40 kg and adults: 2 g/day in 2 divided doses
  or
  amoxicillin/clavulanic acid (**co-amoxiclav**) PO for 7 to 10 days
  The dose is expressed in amoxicillin:
  Children < 40 kg: 80 to 100 mg/kg/day in 2 or 3 divided doses (use formulations in a ratio of 8:1 or 7:1 exclusively)[c].

[a] Critically ill appearing child: weak grunting or crying, drowsy and difficult to arrouse, does not smile, disconjugate or anxious gaze, pallor or cyanosis, general hypotonia.

[b] For penicillin-allergic patients, **clindamycin** PO for 7 to 10 days:
Children: 30 mg/kg/day in 3 divided doses; adults: 1800 mg/day in 3 divided doses

[c] If the only formulation of co-amoxiclav available is 4:1, the dose is 50 mg/kg/day in 3 divided doses.

Children ≥ 40 kg and adults:
Ratio 8:1: 3000 mg/day (= 2 tab of 500/62.5 mg 3 times per day)
Ratio 7:1: 2625 mg/day (= 1 tab of 875/125 mg 3 times per day)
The dose of clavulanic acid should not exceed 12.5 mg/kg/day or 375 mg/day.

– Inpatient antibiotic therapy[d]:
ceftriaxone slow IV[e] (3 minutes) or IV infusion (30 minutes; 60 minutes in neonates) for at least 5 days
Children: 100 mg/kg/day as a single dose on the first day, then 100 mg/kg/day in 2 divided doses
Adults: 1 to 2 g once daily
+
cloxacillin IV infusion (60 minutes)[f]
Neonates 0 to 7 days (< 2 kg): 100 mg/kg/day in 2 divided doses
Neonates 0 to 7 days (≥ 2 kg): 150 mg/kg/day in 3 divided doses
Neonates 8 days to < 1 month (< 2 kg): 150 mg/kg/day in 3 divided doses
Neonates 8 days to < 1 month (≥ 2 kg): 200 mg/kg/day in 4 divided doses
Children 1 month and over: 100 to 200 mg/kg/day in 4 divided doses (max. 8 g/day)
Children ≥ 40 kg and adults: 8 g/day in 4 divided doses
If there is clinical improvement (patient afebrile and erythema and oedema have improved) after 5 days, change to amoxicillin/clavulanic acid PO at the doses indicated above to complete 7 to 10 days of treatment.

If there is no improvement in the first 48 hours (suspicion of methicillin resistant *S. aureus*), replace cloxacillin with:
clindamycin IV infusion (30 minutes)[g]
Neonates 0 to 7 days (< 2 kg): 10 mg/kg/day in 2 divided doses
Neonates 0 to 7 days (≥ 2 kg): 15 mg/kg/day in 3 divided doses
Neonates 8 days to < 1 month (< 2 kg): 15 mg/kg/day in 3 divided doses
Neonates 8 days to < 1 month (≥ 2 kg): 30 mg/kg/day in 3 divided doses
Children 1 month and over: 30 mg/kg/day in 3 divided doses (max. 1800 mg/day)
Adults: 1800 mg/day in 3 divided doses
After 5 days, change to clindamycin PO at the same doses to complete 7 to 10 days of treatment.

– If orbital cellulitis is unresponsive to IV antibiotics, consider an abscess. Transfer patient to a surgical centre for drainage.

[d] For penicillin-allergic patients, clindamycin IV infusion (doses as above).

[e] For administration by IV route, ceftriaxone powder should to be reconstituted in water for injection only. For administration by IV infusion, dilute each dose of ceftriaxone in 5 ml/kg of 0.9% sodium chloride or 5% glucose in children less than 20 kg and in a bag of 100 ml of 0.9% sodium chloride or 5% glucose in children over 20 kg and in adults.

[f] Cloxacillin powder for injection should be reconstituted in 4 ml of water for injection. Then dilute each dose of cloxacillin in 5 ml/kg of 0.9% sodium chloride or 5 % glucose in children less than 20 kg and in a bag of 100 ml of 0.9% sodium chloride or 5% glucose in children over 20 kg and in adults.

[g] Dilute each dose of clindamycin in 5 ml/kg of 0.9% sodium chloride or 5% glucose in children less than 20 kg and in a bag of 100 ml of 0.9% sodium chloride or 5% glucose in children over 20 kg and in adults.

Other pathologies

Onchocerciasis

(river blindness)

Ocular lesions result from the invasion of the eye by microfilariae. They generally develop in adults and progress to blindness in the absence of early treatment.

Clinical features and treatment

Ocular lesions are always associated with onchocercal skin lesions (see Onchocerciasis, Chapter 6).

– Pruritus, hemeralopia (crepuscular blindness), decrease in visual acuity, narrowing of the visual field, awareness of microfilariae in the visual field (the patient sees “little wiggling worms before his eyes”).
– Lesions of the cornea (punctuate, then sclerosing, keratitis), iris (iridocyclitis) or posterior segment (chorioretinopathy and optic atrophy); microfilariae within the anterior chamber or vitreous humor (slit lamp).

For treatment, see Onchocerciasis, Chapter 6. Ivermectin treatment may improve anterior segment lesions (sclerosing keratitis, iridocyclitis) and visual acuity. Severe lesions (chorioretinal lesions, optic atrophy) continue to progress despite treatment.

Loiasis

Clinical features and treatment

Migration of an adult worm under the palpebral or bulbar conjunctiva (white, filiform worm, measuring 4 to 7 cm in length, mobile) and ocular pruritus, lacrimation, photophobia or eyelid oedema.

For treatment, see Loiais, Chapter 6. The migration of the worm is often of very brief duration. Do not attempt to extract it, or administer anaesthetic drops; simply reassure the patient, the event is harmless. Surgical removal is likewise futile if the worm is dead/calcified.

Pterygium

A whitish, triangular growth of fibrovascular tissue extending slowly from the conjunctiva to the cornea. It occurs most frequently in patients who are exposed to wind, dust, or arid climates and never disappears spontaneously.

Clinical features and treatment

Two stages:

– Benign pterygium develops slowly, does not reach the pupil: no treatment.

– Progressive vascularized pterygium: red and inflamed growth covers the pupil and may impair vision:
  • Clean eye with sterile water or 0.9% sodium chloride.
  • Surgical removal if facilities are available.

Cataract

Opacity of the lens that causes a progressive loss of visual acuity. Cataract is common in the tropics and can occur at a younger age than in Europe. The presence of cataract in both eyes leads to blindness. Surgery is the only treatment.

Chapter 6: Parasitic diseases

Protozoan infections

Malaria

Human african trypanosomiasis

American trypanosomiasis

Leishmaniases

Intestinal protozoan infections (parasitic diarrhoea)

Helminthic infections

Flukes

Schistosomiases

Cestodes

Nematode infections

Filariasis

- *Onchocerciasis*
- *Loiasis*
- *Lymphatic filariasis (LF)*

Malaria

Malaria is a parasitic infection due to protozoa of the genus *Plasmodium*, transmitted to humans by the bite of *Anopheles* mosquitoes. Transmission by transfusion of parasite infected blood and transplacental transmission are also possible.
Most infections are due to 5 species: *P. falciparum*, *P. vivax*, *P. ovale, P. malariae* and *P. knowlesi*. All species may cause uncomplicated malaria; severe malaria (defined by the presence of complications) is almost always due to *P. falciparum*.
Clinical suspicion of malaria should be confirmed whenever possible by a parasitological diagnosis. However, treatment of suspected malaria should not be delayed when confirmatory testing is not available: uncomplicated malaria can progress rapidly to severe malaria, and severe malaria may cause death within a few hours if left untreated.

Clinical features

Malaria should always be considered in a patient living in or coming from an endemic area, who presents with fever (or history of fever in the previous 48 hours).

Uncomplicated malaria

Fever is frequently associated with chills, sweating, headache, muscular ache, malaise, anorexia or nausea. In children, fever may be associated with abdominal pain, diarrhoea and vomiting. Anaemia is frequent in children and pregnant women.

Severe malaria

In addition to the above, the patient presents with one or more of the following complications:
– Impaired consciousness, delirium or coma.
– Seizures, generalised or focal (e.g. abnormal eye movements).
– Prostration (extreme weakness; in children: inability to sit or drink/suck).
– Respiratory distress: rapid and laboured breathing or slow, deep breathing.
– Circulatory collapse (shock): cold extremities, weak or absent pulse, slow capillary refill time (> 2 seconds), cyanosis.
– Jaundice (check mucosal surfaces of the mouth, conjunctivae and palms).
– Haemoglobinuria: dark red urine.
– Abnormal bleeding: skin (petechiae), conjunctivae, nose, gums; blood in stools.
– Acute renal failure: urine output < 12 ml/kg/day in children and < 400 ml/day in adults, despite adequate hydration.

Patients presenting with any of the above features or with severe anaemia (Anaemia, Chapter 1) must be hospitalised immediately.

Laboratory

Parasitological diagnosis

Microscopiy

Thin and thick blood films enable parasite detection, species identification, quantification and monitoring of parasitaemia.
Note: blood films may be negative due to sequestration of the parasitized erythrocytes in peripheral capillaries in severe malaria, as well as in placental vessels in pregnant women.

Rapid diagnostic tests (RDTs)[a]

Rapid tests detect parasite antigens. They give only a qualitative result (positive or negative) and may remain positive several days or weeks following effective treatment.

Note: even with positive diagnostic results, rule out other causes of fever.

Additional examinations

Haemoglobin (Hb) level

To be measured routinely in all patients with clinical anaemia, and in all patients with severe malaria.

Blood glucose level

To be measured routinely to detect hypoglycaemia (< 3.3 mmol/l or < 60 mg/dl) in patients with severe malaria and those with malnutrition.

Treatment of malaria due to *P. vivax*[b], *P. ovale*, *P. malariae*, *P. knowlesi*

chloroquine (**CQ**) PO
Children and adults: 10 mg base/kg once daily on D1, D2
5 mg base/kg on D3

P. vivax and *P. ovale* can cause relapses due to activation of dormant parasites in the liver. A treatment with primaquine[c] can be given to eliminate these parasites, after the initial treatment with CQ. However, this treatment is reserved for patients living in areas where re-infection is unlikely, i.e. non-endemic or low transmission areas.

Treatment of uncomplicated falciparum malaria

Antimalarial treatment

During pregnancy, see Antimalarial treatment in pregnant women.

The treatment is an artemisinin-based combination therapy (ACT)[d] given by the oral route for 3 days. The first-line ACT is chosen according to therapeutic efficacy in the area under consideration. Coformulations (2 antimalarials combined in the same tablet) are preferred over coblisters (2 distinct antimalarials presented in the same blister). For dosing information, see table next page.

If vomiting precludes oral therapy, treatment is started using IV or IM artesunate or IM artemether or rectal artesunate, depending on availability, until the patient can tolerate a complete 3-day oral treatment with an ACT.

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[a] Most rapid tests detect the following antigens alone or in combination: HRP2 protein specific to *P. falciparum*; an enzyme (Pf pLDH) specific to *P. falciparum*; an enzyme (pan pLDH) common to all 4 plasmodium species. HRP2 may continue to be detectable for 2 to 3 weeks or more after parasite clearance; pLDH remains detectable for several days (up to 2 weeks) after parasite clearance.

[b] In general, *P. vivax* remains sensitive to CQ but resistance is found in Papua New Guinea, the Solomon Islands, Burma, India, Indonesia and East Timor. In these regions, follow national recommendations.

[c] **Primaquine** PO for 14 days: 0.25 to 0.5 mg/kg once daily in children > 4 years; 15 mg once daily in adults. Primaquine is contra-indicated in individuals with G6PD deficiency. If G6PD deficiency cannot be tested individually, the decision to prescribe primaquine must take into account the prevalence of deficiency in the population.

[d] ACT: a combination of artemisinin or one of its derivatives (e.g. artesunate, artemether) with another antimalarial of a different class.

Treatment of uncomplicated falciparum malaria

ACT	Presentation	Dosage
artemether/ lumefantrine (AL)	**Coformulated tablets** of 20 mg artemether/ 120 mg lumefantrine	On D1, the first dose is given at 0 hour and the 2nd dose at 8-12 hours. Subsequent doses on D2 and D3 are given twice daily (morning and evening).
	Blister child 5 to < 15 kg, 6 tab/blister	==> 1 tab twice daily on D1, D2, D3
	Blister child 15 to < 25 kg, 12 tab/blister	==> 2 tab twice daily on D1, D2, D3
	Blister child 25 to < 35 kg, 18 tab/blister	==> 3 tab twice daily on D1, D2, D3
	Blister child ≥ 35 kg and adult, 24 tab/blister	==> 4 tab twice daily on D1, D2, D3
artesunate/amodiaquine (AS/AQ)	**Coformulated tablets**	
	Blister child 4.5 to < 9 kg, tab of AS 25 mg/AQ base 67.5 mg, 3 tab/blister	==> 1 tab once daily on D1, D2, D3
	Blister child 9 to < 18 kg, tab of AS 50 mg/AQ base 135 mg, 3 tab/blister	==> 1 tab once daily on D1, D2, D3
	Blister child 18 to < 35 kg, tab of AS 100 mg/AQ base 270 mg, 3 tab/blister	==> 1 tab once daily on D1, D2, D3
	Blister child ≥ 36 kg and adult, tab of AS 100 mg/AQ base 270 mg, 6 tab/blister	==> 2 tab once daily on D1, D2, D3
artesunate-sulfadoxine/pyramethamine (AS-SP)	**Co-blister**	
	Coblister child ≤ 25 kg, 3 tab of AS 50 mg + 1 tab of SP 500/25 mg	5 to < 10 kg ==> ½ tab AS once daily on D1, D2, D3 + ½ tab SP as a single dose on D1 10 to < 25 kg ==> 1 tab AS once daily on D1, D2, D3 + 1 tab SP as a single dose on D1
	Coblister child 25 to < 50 kg, 6 tab of AS 50 mg + 2 tab of SP 500/25 mg	==> 2 tab AS once daily on D1, D2, D3 + 2 tab SP as a single dose on D1
	Coblister child ≥ 50 kg and adult, 12 tab of AS 50 mg + 3 tab of SP 500/25 mg	==> 4 tab AS once daily on D1, D2, D3 + 3 tab SP as a single dose on D1
	Coblister child ≥ 50 kg and adult, 6 tab of AS 100 mg + 3 tab of SP 500/25 mg	==> 2 tab AS once daily on D1, D2, D3 + 3 tab SP as a single dose on D1
artesunate/mefloquine (AS/MQ)	**Coformulated tablets**	
	Blister child 5 to < 8 kg, tab of AS 25 mg/MQ 55 mg, 3 tab/blister	==> 1 tab once daily on D1, D2, D3
	Blister child 8 to < 17 kg, tab of AS 25 mg/MQ 55 mg, 6 tab/blister	==> 2 tab once daily on D1, D2, D3
	Blister child 17 to < 30 kg, tab of AS 100 mg/MQ 220 mg, 3 tab/blister	==> 1 tab once daily on D1, D2, D3
	Blister child ≥ 30 kg and adult, tab of AS 100 mg/MQ 220 mg, 6 tab/blister	==> 2 tab once daily on D1, D2, D3
dihydroartemisinine/piperaquine (DHA/PPQ)	**Coformulated tablets**	
	Blister children, tab of 20 mg DHA/160 mg PPQ, 3 tab/blister	5 to < 8 kg: 1 tab 20/160 mg once daily on D1, D2, D3
	Blister children, tab of 40 mg DHA/320 mg PPQ, 3 tab/blister	8 to < 11 kg: 1½ tab 20/160 mg once daily on D1, D2, D3 11 to < 17 kg: 1 tab 40/320 mg once daily on D1, D2, D3
	Blister children, tab of 40 mg DHA/320 mg PPQ, 6 tab/blister	17 to < 25 kg: 1½ tab 40/320 mg once daily on D1, D2, D3 25 to < 36 kg: 2 tab 40/320 mg once daily on D1, D2, D3
	Blister adolescents-adults, tab of 40 mg DHA/320 mg PPQ, 9 tab/blister	36 to < 60 kg: 3 tab 40/320 mg once daily on D1, D2, D3
	Blister adolescents-adults, tab of 40 mg DHA/320 mg PPQ, 12 tab/blister	60 to < 80 kg: 4 tab 40/320 mg once daily on D1, D2, D3 ≥ 80 kg: 5 tab 40/320 mg once daily on D1, D2, D3

Notes:
In infants below the age/weight mentioned in the table above, there is little data on efficacy and safety of ACTs.
The combinations AL, AS/AQ and DHA/PPQ can be used. The dose should be calculated so as to correspond to 10-16 mg/kg/dose of lumefantrine; 10 mg/kg/day of amodiaquine; 20 mg/kg/day of piperaquine).
The combination AS-SP should not be used during the first weeks of life.
Clinical condition of young children can deteriorate rapidly; it may be preferable to start parenteral treatment straight away (see next page).

In the event of failure of correctly administered treatment with a first line ACT, use another ACT.
Quinine PO is still recommended in some national protocols:
quinine PO D1 to D7
Children and adults < 50 kg: 30 mg/kg/day in 3 divided doses at 8-hour intervals
Adults ≥ 50 kg: 1800 mg/day in 3 divided doses at 8-hour intervals

Reduced susceptibility to quinine has been observed in South-East Asia and Amazon region.

Note: *P. falciparum* is resistant to chloroquine (CQ) in Africa, South America, South-East Asia and Oceania but appears to remain sensitive to CQ in Haiti and the Dominican Republic. In these regions, CQ remains the first line treatment (see non-falciparum malaria).

Symptomatic treatment

Paracetamol PO in the event of high fever only (Fever, Chapter 1).

Treatment of severe malaria

The patient must be hospitalised.

Antimalarial treatment

During pregnancy, see Antimalarial treatment in pregnant women.

At dispensary level

Before transfer, administer the first dose of artesunate or artemether IM (loading dose, see below) or one dose of rectal **artesunate** in children less than 6 years:
10 mg/kg as a single dose i.e.:
Children 3 to < 6 kg: 1 suppository 50 mg
Children 6 to < 11 kg: 2 suppositories 50 mg
Children 11 to 20 kg: 1 suppository 200 mg

At hospital level

The drugs of choice is artesunate IV or IM; if artesunate is not available, use artemether IM.

For patients in shock: use artesunate IV or, if not available, quinine IV. The IM route is not appropriate.

artesunate slow IV injection (3 to 5 minutes) or, if not possible, slow IM injection, into the anterior thigh
Children less than 20 kg: 3 mg/kg/dose
Children 20 kg and over and adults: 2.4 mg/kg/dose
– One dose on admission (H0)
– One dose 12 hours after admission (H12)
– One dose 24 hours after admission (H24)
– Then one dose once daily

Administer at least 3 doses, then, if the patient can tolerate oral route, change to an ACT.

or **artemether** IM (anterior thigh)
Children and adults: 3.2 mg/kg on admission (D1) then 1.6 mg/kg once daily.
As soon as the patient can tolerate oral route, change to an ACT.

For completion of therapy by oral route:
– If the duration of parenteral treatment was less than 7 days: treat 3 days with an ACT[e] (see Treatment of uncomplicated falciparum malaria).
– If the duration of parenteral treatment was 7 days: to not give additional oral treatment.

Quinine IV is still recommended in some national protocols. The dose is expressed in quinine salt:
– Loading dose: 20 mg/kg to be administered over 4 hours, then, keep the vein open with an infusion of 5% glucose over 4 hours; then
– Maintenance dose: 8 hours after the start of the loading dose, 10 mg/kg every 8 hours (alternate quinine over 4 hours and 5% glucose over 4 hours).
For adults, administer each dose of quinine in 250 ml of glucose. For children under 20 kg, administer each dose of quinine in a volume of 10 ml/kg of glucose.
Do not administer a loading dose to patients who have received oral quinine, mefloquine within the previous 24 hours: start with maintenance dose.

As soon as the patient can tolerate oral treatment, administer either a 3-day course of ACT[e] or oral quinine to complete 7 days of treatment.
If the combination AS-MQ is used as oral completion treatment following IV quinine, an interval of 12 hours should elapse between the last dose of quinine and the administration of MQ.

Symptomatic treatment and management of complications

Hydration

Maintain adequate hydration. As a guide, volume to be administered per 24 hours by oral or IV route, see Appendix 1a.
Adjust the volume according to clinical condition in order to avoid dehydration or fluid overload (risk of pulmonary oedema).

Fever

Paracetamol in the event of high fever only (Fever, Chapter 1).

Severe anaemia

– Blood transfusion is indicated:
  • In children with Hb < 4 g/dl (or between 4 and 6 g/dl with signs of decompensation[f]).
  • In pregnant women with Hb < 7 g/dl (before 36 weeks) or Hb < 8 g/dl (at 36 weeks or later).
– In other patients with Hb < 7 g/dl, monitor clinical status and Hb level and consider transfusion on a case-by-case basis.

Hypoglycaemia

– If the patient is able to swallow:
  50 ml of **10% glucose**
  or 40 ml of water + 10 ml of **50% glucose**
  or 50 ml of water + 5 g (1 teaspoon) of granulated sugar
  or 50 ml of milk

[e] Do not use AS-MQ if the patient developed neurological signs during the acute phase.

[f] Clinical signs of decompensation may include: shock, impaired consciousness or respiratory distress (acidosis).

– In an unconscious patient:
  Children: 5 ml/kg of **10% glucose**[g] by IV injection (2 to 3 minutes) or infusion
  Adults: 1 ml/kg of **50% glucose** by slow IV injection (3 to 5 minutes)
– Check blood glucose level after 15 minutes. If blood glucose level remains < 3.3 mmol/l or < 60 mg/dl, administer another dose or give glucose by oral route, according to the patient's clinical condition. Hypoglycaemia may recur: maintain regular sugar intake (5% glucose, milk, according to circumstances) and continue to monitor for several hours.

Notes:
– In an unconscious or prostrated patient, in case of emergency or when venous access is unavailable or awaited, use granulated sugar by the sublingual route to correct hypoglycaemia.[h]
– The risk of hypoglycaemia is higher in patients receiving IV quinine.

Coma

Check/ensure the airway is clear, measure blood glucose level and assess level of consciousness (Blantyre or Glasgow coma scale).

In the event of hypoglycaemia or if blood glucose level cannot be measured, administer glucose.

If the patient does not respond to administration of glucose, or if hypoglycaemia is not detected:
– Exclude meningitis (lumbar puncture) or proceed directly to administration of an antibiotic (see Meningitis, Chapter 7).
– Insert a urinary catheter; place the patient in the recovery position.
– Reposition the patient every 2 hours; ensure eyes and mouth are kept clean and moist, etc.
– Monitor vital signs, blood glucose level, level of consciousness, urine output, hourly until stable, then every 4 hours.
– Monitor fluid balance.

Seizures

See Chapter 1. Address possible causes (e.g. hypoglycaemia; fever in children).

Respiratory distress

– Rapid laboured breathing:
  Check for pulmonary oedema, which may occur with or without fluid overload: reduce IV infusion rate if the patient is receiving IV therapy, nurse semi-sitting, oxygen, **furosemide** IV: 1 mg/kg in children, 40 mg in adults. Repeat after 1 to 2 hours if necessary.
  Associated pneumonia should also be considered (see Acute pneumonia, Chapter 2).
– Slow, deep breathing (acidosis):
  Look for dehydration (and correct if present), decompensated anaemia (and transfuse if present).

Oliguria and acute renal failure

Look first for dehydration (Appendix 2), especially due to inadequate fluid intake or excessive fluid losses (high fever, vomiting, diarrhoea). Treat dehydration if present. Be aware of the risk of fluid overload and acute pulmonary oedema. Monitor for the return of urine output.

Acute renal failure (ARF) is found almost exclusively in adults and is more common in Asia than Africa. ARF should be suspected if urine output remains < 400 ml/day or < 20 ml/hour (< 12 ml/kg/day in children) despite adequate rehydration. Insert a urinary catheter, measure output. Restrict fluids to 1 litre/day (30 ml/kg/day in children), plus additional volume equal to urine output. Renal dialysis is often necessary.

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[g] In children, if ready-made G10% solution is not available: add 10 ml of G50% solution per 100 ml of G5% solution to obtain a G10% solution.

[h] Place a level teaspoon of sugar, moistened with a few drops of water, under the tongue, then place the patient in the recovery position. Repeat after 15 min if the patient has not regained consciousness. As with other methods for treating hypoglycaemia, maintain regular sugar intake, and monitor.

Antimalarial treatment in pregnant women

Uncomplicated falciparum malaria

ACT are recommended in all trimesters. However, the combination AS/SP is contra-indicated in HIV-infected pregnant women taking cotrimoxazole preventive therapy.
Quinine PO (± clindamycin) may be an alternative to ACT.

Severe malaria

Artesunate IV or IM or artemether IM are recommended in all trimesters. Quinine IV is still recommended in some national protocols.

Prevention[i]

- In areas with high risk of infection with *P. falciparum*, pregnant women should be tested for malaria at regular interval during antenatal clinic visits. All women with a positive test should receive a 3 day-course of ACT. Women with negative(s) test(s) should receive SP (as a single dose) for its preventive effect, according to a specific schedule (refer to the MSF handbook, *Essential obstetric and newborn care*), but only in regions where SP still has sufficient efficacy.
- In areas with seasonal malaria transmission, seasonal malaria chemoprevention in children < 5 years reduces mortality: administration once monthly of a combination such as amodiaquine + SP.
- In malaria endemic zones and in epidemic-prone contexts, all in-patient facilities (including HIV treatment centres and feeding centres), should be furnished with long-lasting insecticidal nets (LLINs).

[i] See specialised literature for information regarding anti-vector measures and prevention in travellers.

Human african trypanosomiasis
(sleeping sickness)

Human african trypanosomiasis (HAT) is a zoonosis caused by protozoa (trypanosomes), transmitted to humans through the bite of a tsetse fly (*Glossina*). Transmission by contaminated blood transfusion and transplacental transmission are also possible.

The disease is found only in sub-Saharan Africa. There are two forms: *Trypanosoma brucei gambiense* HAT in western and central Africa and *Trypanosoma brucei rhodesiense* HAT in eastern and southern Africa.

Clinical features

Inoculation may be followed by an immediate local reaction (trypanosomal chancre). This chancre arises in about 50% of all rhodesiense but rarely in gambiense.

Gambiense HAT

- Incubation lasts from a few days to several years.
- The first stage (haemolymphatic stage) corresponds to the haematogenous and lymphatic dissemination of the parasite. Signs include intermittent fever, joint pain, lymphadenopathy (firm, mobile, painless lymph nodes, mainly cervical), hepatosplenomegaly and skin signs (facial oedema, pruritus).
- The second stage (meningoencephalitic stage) corresponds to the invasion of the central nervous system. Signs of the haemolymphatic stage recede or disappear and varying neurological signs progressively develop: sensory disturbances (deep hyperaesthesia), psychiatric disorders (apathy or agitation), disturbance of the sleep cycle (with daytime somnolence alternating with insomnia at night), impaired motor functions (paralysis, seizures, tics) and neuroendocrine disorders (amenorrhoea, impotence).
- In the absence of treatment: cachexia, lethargy, coma and death.

Rhodesiense HAT

The first stage is the same as above, but the incubation period is shorter (< 3 weeks), the disease evolves more rapidly and symptoms are more severe. Patients often die of myocarditis in 3 to 6 months without having developed signs of the meningo- encephalitic stage.

In practice, gambiense and rhodesiense HAT can be difficult to differentiate: e.g., there exist cases of acute gambiense infection and others of chronic rhodesiense infection.

Laboratory

- Diagnosis involves 3 steps for gambiense HAT (screening test, diagnostic confirmation and stage determination) and 2 steps for rhodesiense HAT (diagnostic confirmation and stage determination).
- The recommended screening test for *T.b. gambiense* infection is the CATT (Card Agglutination Test for Trypanosomiasis). It detects the presence of specific antibodies in the patient's blood or serum.

– Diagnostic confirmation: presence of trypanosomes in lymph node aspirates or in blood using concentration techniques: capillary tube centrifugation technique (Woo test), quantitative buffy coat (QBC), mini-anion exchange centrifugation technique (mAEC).
– Stage determination: detection of trypanosomes (after centrifugation) and white cell count in the cerebrospinal fluid (lumbar puncture):
  • Haemolymphatic stage: no trypanosomes AND ≤ 5 white cells/mm^3
  • Meningoencephalitic stage: evidence of trypanosomes OR > 5 white cells/mm^3

Treatment (except in pregnant women)

– Due to the toxicity of trypanocides, detection of the parasite is essential before initiating treatment. In the absence of parasitological confirmation, treatment may nevertheless be justified in certain cases: very strong clinical suspicion, patients in life-threatening condition, strong serological suspicion (CATT 1:16 positive) in a population where the disease is highly prevalent (> 2%).
– Several treatment regimens exist. Check national recommendations and local resistance levels.
– Treatment must be administered under close medical supervision. Patients receiving pentamidine can be treated as outpatients but those receiving suramin, eflornithine (with or without nifurtimox) or melarsoprol should be hospitalised.
– After treatment, patients should be checked every 6 months (clinical examination, lumbar puncture and examination for trypanosomes) over 24 months, to look for relapse.

Haemolymphatic stage (Stage I)

Gambiense HAT

pentamidine isetionate deep IM
Children and adults: 4 mg/kg once daily for 7 to 10 days
Patients should receive a source of glucose (meal, sweet tea) one hour before injection (risk of hypoglycaemia); they should remain supine during administration and one hour after injection (risk of hypotension).

Rhodesiense HAT

suramin slow IV
Children and adults: D1: test dose of 4 to 5 mg/kg
D3, D10, D17, D24, D31: 20 mg/kg without exceeding 1 g/injection
Suramin may cause anaphylactic reactions, a test dose is recommended prior to starting treatment. In the event of an anaphylactic reaction after the test dose, the patients must not be given suramin again.

Meningoencephalitic stage (Stage II)

Before administrating trypanocides, the priority is to improve the patient's general condition (rehydration, treatment of malaria, intestinal worms, malnutrition, bacterial infections). It is nonetheless recommended not to postpone the trypanocidal treatment for more than 10 days.

Gambiense HAT

– First choice: nifurtimox-eflornithine combination therapy (NECT)
  nifurtimox PO
  Children and adults: 15 mg/kg/day in 3 divided doses for 10 days
  + **eflornithine** IV infusion over 2 hours
  Children and adults: 400 mg/kg/day in 2 divided infusions (every 12 hours) for 7 days

The catheter must be handled with great attention to avoid local or general bacterial infections: thoroughly disinfect the insertion site, ensure secure catheter fixation, protect the insertion site with a sterile dressing, systematically change the catheter every 48 hours or earlier in case of signs of phlebitis.

– Second choice:
eflornithine IV infusion over 2 hours
Children under 12 years: 600 mg/kg/day in 4 divided infusions (every 6 hours) for 14 days
Adults: 400 mg/kg/day in 4 divided infusions (every 6 hours) for 14 days

– In the event of a relapse after NECT or eflornithine:
melarsoprol slow IV
Children and adults: 2.2 mg/kg once daily for 10 days
Melarsoprol is highly toxic: reactive encephalopathy (coma, or recurrent or prolonged seizures) in 5 to 10% of treated patients, fatal in around 50% of cases; peripheral neuropathy, invasive diarrhoea, severe skin rash, phlebitis, etc.

Prednisolone PO (1 mg/kg once daily) is frequently combined throughout the duration of treatment.

Rhodesiense HAT

melarsoprol slow IV
Children and adults: 2.2 mg/kg once daily for 10 days

Prednisolone PO (1 mg/kg once daily) is frequently combined throughout the duration of treatment.

Treatment in pregnant women

All trypanocides are potentially toxic for the mother and the foetus (risk of miscarriage, malformation, etc.). However, due to the life-threatening risk for the mother and the risk of mother-to-child transmission, treatment must be initiated as follows:

Haemolymphatic stage:
pentamidine for gambiense HAT as of the second trimester and suramin for rhodesiense HAT.

Meningoencephalitic stage:
Treatment depends on the mother's condition:
– If in immediately life-threatening condition: treatment with NECT or eflornithine cannot be deferred until after delivery.
– If not immediately life-threatening condition: pentamidine for gambiense HAT and suramin for rhodesiense HAT. Treatment with NECT or eflornithine is to be administered after delivery.

Prevention and control

– Individual protection against tsetse fly bites: long sleeves and trousers, repellents, keeping away from risk areas (e.g. near rivers).
– Disease control: mass screening and treatment of patients (*T.b. gambiense*), trypanocide treatment of cattle (*T.b. rhodesiense*), vector control using tsetse fly traps or insecticides.

American trypanosomiasis
(Chagas' disease)

Chagas' disease is a zoonosis due to the flagellated protozoan parasite *Trypanosoma cruzi*, transmitted to man by triatomine bugs (reduviidae) through a break in the skin or mucous membranes. Transmission by contaminated blood transfusion and transplacental transmission are also possible.

The disease is only found on the American continent in the area between the south of Mexico and the south of Argentina.

Clinical features

Acute phase

– Depending on the inoculation site, the first sign is a skin chancre or unilateral purplish orbital oedema (Romaña's sign) with local lymphadenopathy and fever (38°C, higher in children) over several weeks.
– This is followed by multiple lymphadenopathies, hepatosplenomegaly, myocarditis (chest pain, heart failure), sometimes meningoencephalitis (seizures, paralysis).
– Acute phase may be asymptomatic or subclinical.

The transition from the acute to chronic phase does not always occur.

Chronic phase

– Follows a long latent period after the acute phase: cardiac lesions (arrhythmia and conduction disorders, cardiomyopathy, heart failure, chest pain, thromboembolism) and gastrointestinal lesions (megaoesophagus and megacolon).
– Most patients are asymptomatic.

Laboratory

Acute phase

– Thin or thick film: detection of the parasite in blood or lymph nodes.
– Serologic tests: detection of anti-*Trypanosoma cruzi* antibodies.
– Xenodiagnosis: examination of the faeces of uninfected triatomine bug fed with the patient's blood.

Chronic phase

– Serologic tests: detection of anti-*Trypanosoma cruzi* antibodies.

Treatment

Phase aiguë

nifurtimox PO (contra-indicated in the first trimester of pregnancy, breast-feeding or in patients with history of mental disorders or seizures):
Patient under 40 kg: 10 to 12 mg/kg/day in 2 to 3 divided doses for 30 to 60 days
Patient over 40 kg: 8 mg/kg/day in 2 to 3 divided doses for 30 to 60 days

The adverse effects of nifurtimox (anorexia, nausea, gastric pain, agitation, sleeping disorders, seizures) occur in less than 20% of cases and must not result in treatment discontinuation. Avoid alcohol during treatment.

or

benznidazole PO (contra-indicated in the first trimester of pregnancy and breast-feeding):
Patient under 40 kg: 7.5 mg/kg/day in 2 to 3 divided doses for 30 to 60 days
Patient over 40 kg: 5 mg/kg/day in 2 to 3 divided doses for 30 to 60 days
The minor adverse effects of benznidazole (nausea, skin rash) occur in about 50% of patients. In the event of purpura with fever, paraesthesia or peripheral polyneuritis, stop treament.

Chronic phase in children under 12 years

benznidazole PO
Children under 40 kg: 7.5 mg/kg/day in 2 to 3 divided doses for 30 to 60 days
Children over 40 kg: 5 mg/kg/day in 2 to 3 divided doses for 30 to 60 days

Chronic phase in children over 12 years and adults

Do not treat in the event of pregnancy, breast-feeding, hepatic or renal failure, or a severe intercurrent pathology.

nifurtimox PO

8 to 10 mg/kg/day in 2 to 3 divided doses for 60 to 90 days
or
benznidazole PO
5 mg/kg/day in 2 to 3 divided doses for 60 days

Symptomatic treatment

See Seizures (Chapter 1), Pain (Chapter 1) and Heart failure (Chapter 12).

Prevention

- Improvement of housing and vector control: plastered walls and cement floors, corrugated-iron roofs, insecticide spraying.
- Blood transfusions: screening donor blood for *T. cruzi* infection.

Leishmaniases

The leishmaniases are a group of parasitic diseases caused by protozoa of the genus *Leishmania*, transmitted by the bite of a sandfly. Over 20 species cause disease in man.

– *Cutaneous* leishmaniasis is endemic in more than 70 countries in South and Central America, Middle East, Central Asia, and Africa.
– *Mucocutaneous* leishmaniasis occurs in Latin America and, more rarely, in Africa (Ethiopia, Sudan).
– *Visceral* leishmaniasis occurs in more than 60 countries in East and North Africa, South and Central Asia, Southern Europe, and South and Central America.

Clinical features

Cutaneous and mucocutaneous leishmaniasis

– Single or multiple lesions on the uncovered parts of the body: an erythematous papule begins at the sandfly bite, enlarges to a nodule and extends in surface and depth to form a scabbed ulcer. Ulcers are painless, unless there is secondary bacterial or fungal infection. Usually, lesions heal spontaneously, leaving a scar, and result in lifelong protection from disease.
– Lesions may also spread to the mucosa (mouth, nose, conjunctiva) giving rise to the mucocutaneous form, which may cause severe disfigurement.

Visceral leishmaniasis

Visceral leishmaniasis (kala azar) is a systemic disease, resulting in pancytopenia, immunosuppression, and death if left untreated.

– Prolonged (> 2 weeks) irregular fever, splenomegaly, and weight loss are the main signs.
– Other signs include: anaemia, diarrhoea, epistaxis, lymphadenopathy, moderate hepatomegaly.
– Bacterial diarrhoea, pneumonia, and tuberculosis may develop due to immunosuppression.

Post-kala azar dermal leishmaniasis

Macular, nodular or papular skin rash of unknown aetiology, particularly on the face, and typically occurring after apparent cure of visceral leishmaniasis.

Laboratory

Cutaneous and mucocutaneous leishmaniasis

– Parasitological diagnosis: identification of Giemsa-stained parasites in smears of tissue biopsy from the edge of the ulcer.
– No useful serological tests.

Visceral leishmaniasis

– Parasitological diagnosis: identification of Giemsa-stained parasites in smears of splenic, bone marrow, or lymph node aspiration-biopsy. Splenic aspiration is the most sensitive technique but carries a theoretical risk of potentially fatal haemorrhage.
– Serological diagnosis: rK39 dipstick test and direct agglutination test (DAT) can be used for diagnosis of primary visceral leishmaniasis in clinically suspect cases. Diagnosis of relapse is only by parasitological confirmation.

Treatment

The various species of *Leishmania* respond differently to drugs. Follow national recommendations. For information:

Cutaneous and mucocutaneous leishmaniasis

– Cutaneous lesions generally heal spontaneously in 3 to 6 months. Treatment is only indicated if lesions are persistent (> 6 months), disfiguring, ulcerating, or disseminated.
– Forms with a single lesion or few lesions: start with local treatment with a pentavalent antimonial: **sodium stibogluconate** or **meglumine antimoniate**, 1 to 2 m 6 infiltrated into the lesion if it is a nodule and into the edges and base around the crust if it is an ulcer.
It should be repeated every 3 to 7 days for 2 to 4 weeks. Once healing begins, the treatment can be stopped and healing will continue.
– IM treatment with a pentavalant antimonial (20 mg/kg/day for 10 to 20 days) is restricted to severe cases and must be administered under close medical supervision.
– Miltefosine PO (as for visceral leishmaniasis) for 28 days is effective in many forms of cutaneous leishmaniasis.
– Ulcers are often secondarily infected with streptococci and staphylococci: administer suitable antibiotics.
– Mucocutaneous forms: as for visceral leishmaniasis.

Visceral leishmaniasis

Visceral leishmaniasis in East Africa

– First-line treatment:
a **pentavalent antimonial** IM or slow IV: 20 mg/kg/day for 17 days
+ **paromomycin** IM: 15 mg (11 mg base)/kg/day for 17 days
– Second-line treatment for relapse and for specific vulnerable groups: severe disease, pregnant women, patients over 45 years:
liposomal amphotericin B IV infusion: 3 to 5 mg/kg/day for 6 to 10 days up to a total dose of 30 mg/kg
– Treatment in HIV co-infected patients:
liposomal amphotericin B IV infusion: 3 to 5 mg/kg/day for 6 to 10 days up to a total dose of 30 mg/kg
+ **miltefosine** PO for 28 days:
Children 2 to 11 years: 2.5 mg/kg/day
Children > 11 years and < 25 kg: 50 mg/day
Children and adults 25 to 50 kg: 100 mg/day
Adults > 50 kg: 150 mg/day

Visceral leishmaniasis in South Asia

– First-line treatment:
  liposomal amphotericin B IV infusion: 3 to 5 mg/kg/day for 3 to 5 days up to a total dose of 15 mg/kg
  or
  liposomal amphotericin B IV infusion: 10 mg/kg as a single dose
– Second-line treatment for relapse:
  liposomal amphotericin B IV infusion: 3 to 5 mg/kg/day for 5 to 8 days up to a total dose of 25 mg/kg

For all patients with visceral leishmaniasis, hydration, nutritional support and treatment of intercurrent infections (malaria, dysentery, pneumonia, etc.) are essential.
Tuberculosis and/or HIV infection may also be present and should be suspected if relapse occurs more than once or in the event of treatment failure.

Post-kala azar dermal leishmaniasis (PKDL)

Only patients with severe or disfiguring disease or with lesions remaining for > 6 months, and young children with oral lesions that interfere with feeding, are treated.

PKDL in East Africa

a **pentavalent antimonial** IM or slow IV: 20 mg/kg/day for 17 to 60 days
+ **paromomycin** IM: 15 mg (11 mg base)/kg/day for 17 days
or
liposomal amphotericin B IV infusion: 2.5 mg/kg/day for 20 days
or
miltefosine PO for 28 days (as for visceral leishmaniasis) may be beneficial in HIV co-infected patients

PKDL in South Asia

liposomal amphotericin B IV infusion: 5 mg/kg/day twice weekly up to a total dose of 30 mg/kg

Prevention

– Insecticide-treated mosquito nets.
– Vector control and elimination of animal reservoir hosts..

Intestinal protozoan infections (parasitic diarrhoea)

The most important intestinal protozoan infections are amoebiasis (*Entamoeba histolytica*), giardiasis (*Giardia lamblia*), cryptosporidiosis (*Cryptosporidium* sp), cyclosporiasis (*Cyclospora cayetanensis*) and isosporiasis (*Isospora belli*).

Intestinal protozoa are transmitted by the faecal-oral route (soiled hands, ingestion of food or water contaminated with faeces) and may cause both individual cases of diarrhoea and epidemic diarrhoea outbreaks.

Clinical features

– Amoebiasis gives rise to bloody diarrhoea (see Amoebiasis, Chapter 3).

– Clinical presentation of giardiasis, cryptosporidiosis, cyclosporiasis and isosporiasis is very similar:
  - Diarrhoea is usually mild and self-limiting, except in children and patients with advanced HIV disease (CD4 < 200). These patients are likely to develop severe, intermittent or chronic diarrhoea that may be complicated by malabsorption with significant wasting (or failure to gain weight in children) or severe dehydration.
  - Stools are usually watery, but steatorrhoea (pale, bulky, fatty stools) may be found in the event of secondary fat malabsorption; stools may contain mucus.
  - Diarrhoea is usually associated with non-specific gastrointestinal symptoms (abdominal distension and cramps, flatulence, nausea, anorexia), but patients have low-grade fever or no fever.

Laboratory

Definitive diagnosis relies on parasite identification in stool specimens (trophozoites and cysts for giardia; oocysts for cryptosporidium, cyclospora, isospora). Two to three samples, collected 2 to 3 days apart are necessary, as pathogens are shed intermittently.

Treatment

– Correct dehydration if present (for clinical features and management, see Appendix 2).

– If the causal agent has been identified in the stool:

Giardiasis	**tinidazole** PO as a single dose Children: 50 mg/kg (max.2 g) Adults: 2 g	or	**metronidazole** PO for 3 days Children: 30 mg/kg once daily Adults: 2 g once daily
Cryptosporidiosis	In immunocompetent patients, no aetiological treatment; spontaneous resolution in 1 to 2 weeks.		
Cyclosporiasis	**co-trimoxazole** PO for 7 days Children: 50 mg SMX + 10 mg TMP/kg/day in 2 divided doses Adults: 1600 mg SMX + 320 mg TMP/day in 2 divided doses In immunocompetent patients, symptoms usually resolve spontaneous in 1 to 3 weeks. Treatment is given in case of severe or prolonged symptoms.		
Isoporiasis	**co-trimoxazole** PO for 7 to 10 days Adults: 1600 to 3200 mg SMX + 320 to 640 mg TMP/ day in 2 divided doses In immunocompetent patients, symptoms usually resolve spontaneous in 2 to 3 weeks. Treatment is given in case of severe prolonged symptoms.		

– If reliable stool examination cannot be carried out: parasitic diarrhoeas cannot be differentiated on clinical grounds, nor is it possible to distinguish these from non- parasitic diarrhoeas. An empirical treatment (using tinidazole or metronidazole and cotrimoxazole as above, together or in succession) may be tried in the case of prolonged diarrhoea or steatorrhoea. In patients with HIV infection, see empirical treatment (HIV infections and AIDS, page 228, Chapter 8).

– In patients with advanced HIV disease, cryptosporidiosis, cyclosporiasis and isosporiasis are opportunistic infections; the most effective intervention is the treatment of the underlying HIV infection with antiretrovirals. Patients remain at high risk for dehydration/death until immunity is restored.

Flukes

Infection/Epidemiology	Clinical features/Diagnosis	Treatment
Lung flukes *Paragonimus* sp *Distribution*: South-East Asia, China, parts of Cameroon, Nigeria, Gabon, Congo, Colombia, Peru *Transmission*: eating raw freshwater crustaceans	The two most prominent symptoms are prolonged (> 2 weeks) productive cough and intermittent haemoptysis (rusty-brown sputum). In endemic areas, paragonimosis should be considered whenever pulmonary tuberculosis is suspected as the clinical and radiological features overlap. Paragonimosis is confirmed when eggs are detected in sputum (or possibly in stools).	**praziquantel** PO Children > 2 years and adults: 75 mg/kg/day in 3 divided doses for 2 to 3 days
Hepatobiliary flukes *Fasciola hepatica* and *gigantica* *Distribution*: worldwide, in areas where sheep and cattle are raised *Transmission*: eating uncooked aquatic plants	*During migration phase*: asthenia, prolonged fever, myalgia, right upper quadrant pain, mid hepatomegaly; sometimes, allergic signs (e.g. pruritus). At this stage, the diagnosis is rarely considered and can only be confirmed through serology; parasitological examination of stools is always negative. *Once adult flukes are present in the biliary tract*: presentation resembles cholelithiasis: right upper quadrant pain, recurrent episodes of obstructive jaundice/ febrile cholangitis. The diagnosis is confirmed when parasite eggs are detected in stools (or flukes are seen in the biliary tract with sonography).	**triclabendazole** PO Children and adults: 10 mg/kg as a single dose May repeat in 24 hours in the event of severe infection
Opisthorchis felineus (Asia, Eastern Europe) *Opisthorchis viverrini* (Cambodia, Laos, Vietnam, Thailand) *Clonorchis sinensis* (China, Koera, Vietnam) *Transmission*: eating raw/undercooked freshwater fish	Abdominal pain and diarrhoea. With heavy infection, hepatobiliary symptoms: hepatomegaly, right upper quadrant pain, jaundice or episodes of febrile cholangitis. The diagnosis is confirmed when parasite eggs are detected in stools.	**praziquantel** PO Children > 2 years and adults: 75 mg/kg/day in 3 divided doses for 1 or 2 days
Intestinal flukes *Fasciolopsis buski* (India, Bangladesh, South-East Asia) *Heterophyes heterophyes* (South-East Asia, Nile delta) *Metagonimus yokogawai* (Siberia, China, Korea) *Transmission*: eating uncooked aquatic plants (*F. buski*), raw/undercooked fish (other species)	Symptoms are limited to diarrhoea and epigastric or abdominal pain. With massive infection, *F. buski* can cause oedematous allergic reactions (including ascites, anasarca). The diagnosis is confirmed when parasite eggs are detected in stools.	**praziquantel** PO Children > 2 years and adults: 75 mg/kg/day in 3 divided doses for 1 day

Schistosomiases

Schistosomiases are acute or chronic visceral parasitic diseases due to 5 species of trematodes (schistosomes).

The three main species infecting humans are *Schistosoma haematobium*, *Schistosoma mansoni* and *Schistosoma japonicum*. *Schistosoma mekongi* and *Schistosoma intercalatum* have a more limited distribution (see table next page).

Humans are infected while wading/bathing in fresh water infested with schistosome larvae. Symptoms occurring during the phases of parasite invasion (transient localized itching as larvae penetrate the skin) and migration (allergic manifestations and gastrointestinal symptoms during migration of schistosomules) are frequently overlooked. In general, schistosomiasis is suspected when symptoms of established infection become evident (see table next page).

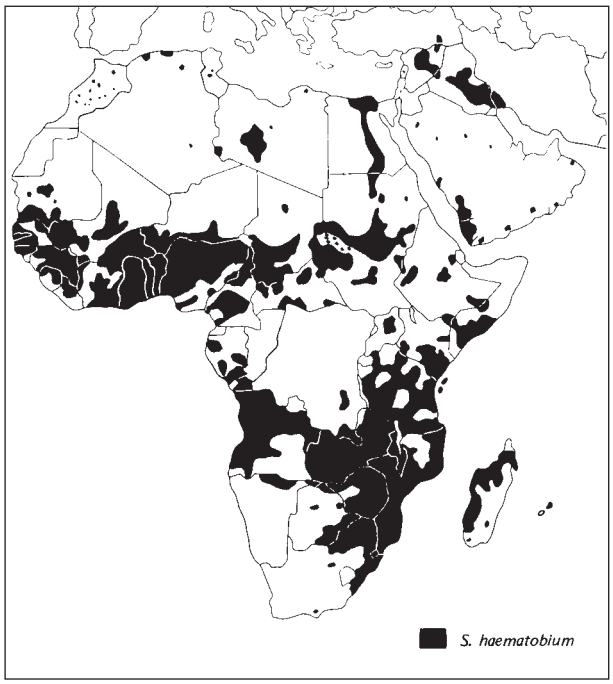
Each species gives rise to a specific clinical form: genito-urinary schistosomiasis due to *S. haematobium*, intestinal schistosomiasis due *S. mansoni*, *S. japonicum*, *S. mekongi* and *S. intercalatum*.

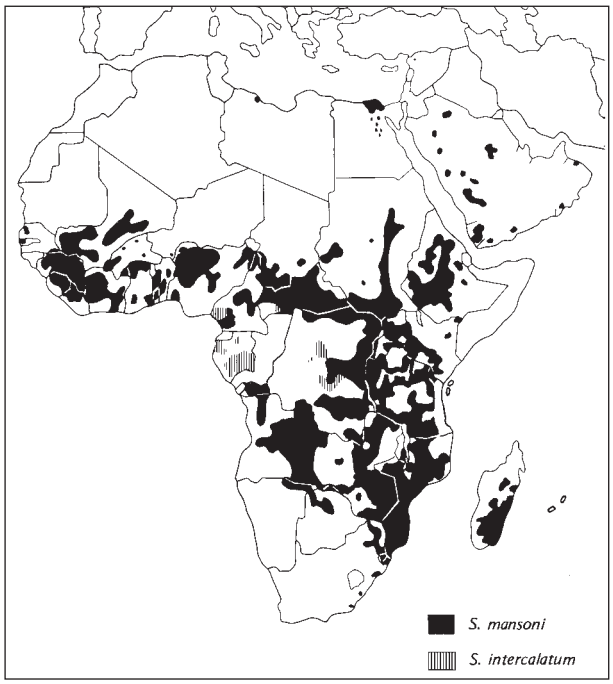
The severity of the disease depends on the parasite load. Heavily infected patients are prone to visceral lesions with potentially irreversible sequelae.

Children aged 5 to 15 years are particularly at risk: prevalence and parasite load are highest in this age group.

An antiparasitic treatment should be administered to reduce the risk of severe lesions, even if there is a likelihood of re-infection.

Geographic distribution of schistosomiasis in Africa (WHO)





	Parasite/Epidemiology	Clinical features/Diagnosis (established infection)	Treatment
Genito-urinary schistosomiasis	***S. haematobium*** *Distribution*: Africa, Madagascar and the Arabian peninsula	• Urinary manifestations: – In endemic areas, urinary schistosomiasis should be suspected in any patients who complain of macroscopic haematuria (red coloured urine throughout, or at the end of, micturition). Haematuria is frequently associated with polyuria/dysuria (frequent and painful micturition). – In patients, especially children and adolescents, with urinary symptoms, visual inspection of the urine (and dipstick test for microscopic haematuria if the urine appears grossly normal) is indispensible. – Presumptive treatment is recommended in the presence of macro- or microscopic haematuria, when parasitological confirmation (parasite eggs detected in urine) cannot be obtained. • Genital manifestations: In women, symptoms of genital infection (white-yellow or bloody vaginal discharge, itching, lower abdominal pain, dyspareunia) or vaginal lesions resembling genital warts or ulcerative lesions on the cervix; in men, haematospermia (blood in the semen). • If left untreated: risk of recurrent urinary tract infections, fibrosis/calcification of the bladder and ureters, bladder cancer; increased susceptibility to sexually transmitted infections and risk of infertility. • In endemic areas, genito-urinary schistosomiasis may be a differential diagnosis to the genito-urinary tuberculosis, and in women, to the sexually transmitted infections (especially in women with an history of haematuria).	The same antiparasitic treatment is used for all species: **praziquantel** PO Children > 2 years and adults[a]: 40 mg/kg as a single dose
Intestinal schistosomiasis	***S. mansoni*** *Distribution*: tropical Africa, Madagascar, the Arabian peninsula, South America (especially Brazil) ***S. japonicum*** *Distribution*: China, Indonesia, the Philippines ***S. mekongi*** *Distribution*: parts of Lao PDR, Cambodia (along the Mekong River) ***S. intercalatum*** *Distribution*: parts of DRC, Congo, Gabon, Cameroon, Chad	• Non-specific digestive symptoms (abdominal pain; diarrhoea, intermittent or chronic, with or without blood) and hepatomegaly. • For *S. intercalatum*: digestive symptoms only (rectal pain, tenesmus, rectal prolapse, bloody diarrhoea). • If left untreated: risk of hepatic fibrosis, portal hypertension, cirrhosis, gastrointestinal haemorrhage (hematemesis, melanea, etc.), except with *S. intercalatum* (less pathogenic than other intestinal schistosomes, no severe hepatic lesions). • The diagnosis is confirmed when parasite eggs are detected in stools. • In the absence of reliable parasitological diagnosis: in areas where intestinal schistosomiasis is common, diarrhoea (especially bloody diarrhoea) with abdominal pain and/or hepatomegaly may be a basis for presumptive diagnosis and treatment.	

[a] For the treatment of schistosomiasis, praziquantel may me administered to pregnant women.

Cestodes (adult forms)

Parasites	Clinical features/Laboratory	Treatment	Transmission/Prevention
Taeniasis *Taenia saginata* *Taenia solium* (worldwide)	Often asymptomatic Segments expelled in the stools, sometimes gastrointestinal disturbances (epigastric or abdominal pain, nausea, diarrhoea) Laboratory: eggs in stools or collected from perianal skin (scotch tape method), segments in stools	**praziquantel** PO[a] Children over 4 years and adults: 5 to 10 mg/kg as a single dose or **niclosamide** PO Children: 50 mg/kg as a single dose Adults: 2 g as a single dose Thoroughly chew the tablets before swallowing and wash down with as little water as possible.	**Transmission** by eating raw or undercooked meat: • beef for *T. saginata* • pork for *T. solium* **Prevention**: • individual: cook meat thoroughly • collective: slaughterhouse monitoring
Diphyllobothriasis *Diphyllobothrium latum* (temperate or cold lake areas)	Often asymptomatic In the event of heavy infection: mild gastrointestinal disturbances, anaemia due to vitamin B_{12} deficiency associated with (rare) neurological sequelae Laboratory: eggs in stools	**praziquantel** PO[a] Children over 4 years and adults: 10 to 25 mg/kg as a single dose or **niclosamide** PO EChildren: 50 mg/kg as a single dose Adults: 2 g as a single dose Thoroughly chew the tablets before swallowing and wash down with as little water as possible. If anaemia: **vitamin B_{12} + folic acid**	**Transmission** by eating raw or undercooked freshwater fish **Prevention**: • individual: cook fish thoroughly
Hymenolepiasis *Hymenolepis nana* (worldwide)	Often asymptomatic In the event of heavy infection: gastrointestinal disturbances (epigastric pain) Laboratory: eggs in stools	**praziquantel** PO[a] Children over 4 years and adults: 15 to 25 mg/kg as a single dose or **niclosamide** PO Adults: 2 g as a single dose on D1, then 1 g/day for 6 days Thoroughly chew the tablets before swallowing and wash down with as little water as possible.	**Transmission** by faecal-oral route or auto-infection **Prevention**: • individual: hand washing, nail cutting • collective: hygiene and sanitation (water, latrines, etc.)

[a] Praziquantel may be administered to pregnant women with *T. solium* taeniasis. For the other indications, treatment can usually be deferred until after delivery.

Cestodes (larvae)

Parasites	Clinical features/Laboratory	Treatment	Transmission/Prevention
Cysticercosis *Taenia solium* (worldwide)	• Muscular: asymptomatic or myalgia • Subcutaneous: nodules • Neurological (neurocysticercosis) headache, convulsions, coma, etc. • Ocular: exophthalmia, strabismus, iritis, etc. Laboratory: hypereosinophilia in blood and cerebrospinal fluid	Neurological and ocular cysticercosis should be managed in specialized facilities. Antiparasitic treatment without diagnosis of location by computerirsed tomography and/or magnetic resonance imaging can worsen the symptoms even threat the life. Neurosurgical treatment can be required.	**Transmission** by eating food contaminated with *T. solium* eggs or auto-infection **Prevention**: • individual: treat *T. solium* carriers, hygiene, cook meat thoroughly
Hydatid cyst *Echinococcus granulosus* (South America, North, East and South Africa, Western Europe)	Cysts located in the liver (60% of cases); lungs (30% of cases), and, less frequently, in other sites including the brain. Long asymptomatic period. The cyst becomes symptomatic when complications develop (biliary obstruction; anaphylactic shock in the event of rupture into peritoneal cavity, vessels or an organ; febrile painful jaundice in the event of rupture into the biliary tree, etc.).	First-line treatment: surgical excision **albendazole** PO[b] is useful in addition to, or instead of, surgery: Children over 2 years and adults under 60 kg: 15 mg/kg/day in 2 divided doses Adults over 60 kg: 800 mg/day in 2 divided doses Treatment duration: In addition to surgery (pre-operatively or post-operatively): continuous course of minimum 2 months or at least two 28-day courses with a drug-free interval of 14 days. Inoperable cases: 28-day courses with drug-free intervals of 14 days, for 3 to 6 months (on average), possibly up to 1 year.	**Transmission**: • direct: contact with dogs • indirect: water and food contaminated by dog faeces **Prevention**: • individual: avoid contact with dogs • collective: eliminate stray dogs, monitor slaughterhouses

[b] Albendazole is contra-indicated during the first trimester of pregnancy.

Nematode infections

Infection/Epidemiology	Clinical features/Diagnosis	Treatment
Ascariasis (roundworms)[a] *Ascaris lumbricoides* *Distribution*: worldwide, mainly in tropical and subtropical *Transmission*: ingestion of ascaris eggs	• *During larval migration* Loeffler 's syndrome: transient pulmonary symptoms (dry cough, dyspnoea, wheezing) and mild fever. • *Once adult worms are present in the intestine* Abdominal pain and distension. In general, the diagnosis is made when adult worms are expelled from the anus (or occasionally from the mouth). Ascaris are large (15-30 cm), cylindrical worms, pinkish-white, with slightly tapered ends. • *Complications* Ascariasis is usually benign, but massive infestation may cause intestinal obstruction (abdominal pain, vomiting, constipation), especially in children < 5 years. Worms may accidentally migrate to gall bladder, liver or peritoneum, causing jaundice, liver abscess, or peritonitis. • Ascaris eggs may be detected through parasitological examination of stools.	**albendazole** PO as a single dose Children > 6 months and adults: 400 mg (200 mg in children > 6 months but < 10 kg) or **mebendazole** PO for 3 days Children > 6 months and adults: 200 mg/day in 2 divided doses (100 mg/day in 2 divided doses in children > 6 months but < 10 kg)
Trichuriasis (whipworms)[a] *Trichuris trichiura* *Distribution and transmission*: as for *A. lumbricoides*	• In heavy infection: abdominal pain and diarrhoea. • In massive infection: chronic bloody diarrhea, tenesmus, rectal prolapse due to frequent attempts to defecate, especially in children. Worms may sometimes be seen on the rectal mucosa when prolapsed: these are grayish-white, 3-5 cm in length, in the shape of a whip, with a thickened body and a long, threadlike extremity. • Trichuris eggs may be detected through parasitological examination of stools.	**albendazole** PO for 3 days Children > 6 months and adults: 400 mg once daily (200 mg once daily in children > 6 months but < 10 kg) or **mebendazole** PO PO for 3 days, as for ascariasis. A single dose of albendazole or mebendazole is often insufficient.
Ankylostomiase[a] *Ancylostoma duodenale* *Necator americanus* *Distribution*: tropical and subtropical regions *Transmission*: larval skin penetration following contact (feet, hands) with contaminated soil	• *During larval penetration/migration* Cutaneous signs (pruritic papulo-vesicular rash at the site of penetration, usually the feet) and pulmonary symptoms (similar to ascariasis). • *Once adult worms are present in the intestine* Mild abdominal pain. Attachment of the parasite to the mucosa leads to chronic blood loss and anaemia (in endemic areas, antihelminthic treatment is recommended for patients with iron-deficiency anaemia). • Hookworm eggs may be detected through parasitological examination of stools.	**albendazole** as a single dose (as for ascariasis) is much more effective than mebendazole as a single dose. When using **mebendazole**, a 3-day treatment (as for ascariasis) is recommended. Treatment of anaemia (Chapter 1).

[a] Roundworms, whipworms and hookworms frequently co-infect the same host. This should be taken into account when prescribing antihelminthic treatment.

Infection/Epidemiology	Clinical features/Diagnosis	Treatment
Strongyloidiasis *Strongyloides stercoralis* *Distribution*: humid tropical regions *Transmission*: larval skin penetration and auto-infection	• *Acute strongyloidiasis* – During larval penetration/migration: cutaneous signs (erythema and pruritus at the site of penetration, which may persist several weeks) and pulmonary symptoms (similar to ascariasis). – Once larvae are present in the intestine: gastrointestinal symptoms (bloating, abdominal and epigastric pain, vomiting, diarrhoea). • *Chronic strongyloidiasis* Intestinal larvae may re-infect their host (auto-infection) by penetrating through the intestinal wall or by migrating transcutaneously from perianal skin. Chronic infections result in prolonged or recurrent pulmonary and gastrointestinal symptoms. Transcutaneous migration of intestinal larvae gives rise to a typical rash (larva currens), mainly in the anal region and on the trunk: sinuous, raised, linear, migrating lesion, intensely pruritic, moving rapidly (5 to 10 cm/hour) and lasting several hours or days[b]. • *Complications* Hyperinfection (massive infestation) results in exacerbation of pulmonary and gastrointestinal symptoms, and possible dissemination of larvae to atypical locations, (CNS, heart, etc.). This form occurs mainly in patients receiving immunosuppressive therapy (e.g. corticosteroids). • Strongyloides larvae may be detected through parasitological examination of stools.	First line treatment is: **ivermectin** PO[b] as a single dose Children > 15 kg and adults: 200 micrograms/kg, on an empty stomach While less effective, a 3-day treatment with **albendazole** PO (as for trichuriasis) may be an alternative. Hyperinfections are refractory to conventional therapy. Prolonged or intermittent multiple-dose regimens are required.
Enterobiasis (pinworms) *Enterobius vermicularis* *Distribution*: worldwide *Transmission*: faecal-oral route or auto-infection	• Anal pruritus, more intense at night, vulvovaginitis in girls (rare). In practice, the diagnosis is most often made when worms are seen on the perianal skin (or in the stool in heavy infestation). Pinworms are small (1 cm), mobile, white, cylindrical worms with slightly tapered ends. • Pinworm eggs may be collected from the anal area (scotch tape method) and detected under the microscope.	**albendazole** PO as a single dose, as for ascariasis or **mebendazole** PO as a single dose Children > 6 months and adults: 100 mg (50 mg in children > 6 months but < 10 kg) A second dose may be given after 2 to 4 weeks.

[b] The migrating larvae of *Ancylostoma braziliense* and *caninum* (hookworms of cats and dogs) also present as a pruritic, inflammatory, creeping eruption in humans (cutaneous larva migrans) but with a slower rate of progression and a longer duration (several weeks or months). Treatment is with **albendazole** (400 mg as a single dose or once daily for 3 days in children > 6 months and adults; 200 mg in children > 6 months but < 10 kg) or **ivermectin** (200 micrograms/kg as a single dose).

Infection/Epidemiology	Clinical features/Diagnosis	Treatment
Trichinellosis *Trichinella* sp *Distribution*: worldwide, particularly frequent in Asia (Thailand, Laos, China, etc. *Transmission*: consumption of raw or undercooked meat containing trichinella larvae (pork, wart-hog, bear, dog, etc.)	• *Enteric phase* (1 to 2 days after ingestion of infected meat) Self-limited episode of diarrhoea and abdominal pain lasting several days. • *Muscular phase* (about 1 week after ingestion) High fever; muscular pain (ocular [pain on eye movement], masseters [limitation of mouth opening], throat and neck [pain with swallowing and speech], trunk and limbs); facial or bilateral peri-orbital oedema; conjunctival haemorrhage, subungual haemorrhage; headache. Typical features are not always present and the patient may present with a non-specific flu-like syndrome. Other features, such as dietary habits (consuming pork/raw meat), suggestive symptoms (fever > 39°C and myalgia and facial oedema) in several individuals who have shared the same meal (e.g. ceremony) or hypereosinophilia > 1000/mm3, reinforce the clinical suspicion. • Definitive diagnosis: muscle biopsy; serology (ELISA, Western Blot).	**albendazole** PO for 10 to 15 days Children > 2 years: 10 mg/kg/day in 2 divided doses Adults: 800 mg/day in 2 divided doses or **mebendazole** PO for 10 to 15 days Children > 2 years: 5 mg/kg/day in 2 divided doses Adults: 400 mg/day in 2 divided doses *plus, regardless of which anti-helminthic is chosen:* **prednisolone** PO 0.5 to 1 mg/kg/day for the duration of treatment

Filariasis

Filariases are helminthiases due to tissue-dwelling nematode worms (filariae). Human to human transmission takes place through the bite of an insect vector.

The most important pathogens are outlined in the table below. Mixed infections are common in co-endemic regions.

Each filarial species is found in 2 principal developmental stages: macrofilariae (adult worms) and microfilariae (larval offspring). The treatment depends on the pathogenic stage of the species considered and targets microfilariae for *O. volvulus* and macrofilariae for the other species.

Species/Infections	Location of macrofilariae	Location of microfilariae	Pathogenic stage	Presence of *Wolbachia*
Onchocerca volvulus (onchocerciasis)	Subcutaneous nodules	Skin and eye	Microfilariae	Yes
Loa loa (loiasis)	Subcutaneous tissue	Blood	Macrofilariae	No
Wuchereria bancrofti, ***Brugia malayi*** and ***Brugia timori*** (lymphatic filariasis)	Lymph vessels	Blood	Macrofilariae	Yes

Classical antifilarial agents include diethylcarbamazine (DEC), ivermectin and albendazole. Doxycycline is used solely in the treatment of *O. volvulus* and lymphatic filarial worms, which harbour an endosymbiotic bacterium (*Wolbachia*) sensitive to doxycycline.

Onchocerciasis

(river blindness)

The distribution of onchocerciasis is linked to that of its vector (*Simulium*), which reproduces near rapidly flowing rivers in intertropical Africa (99% of cases), Latin America (Guatemala, Mexico, Ecuador, Colombia, Venezuela, Brazil) and Yemen.

Clinical features

In endemic areas, the following signs, alone or in combination, are suggestive of onchocerciasis:

– Onchocercomas: painless subcutaneous nodules containing adult worms, usually found over a bony prominence (iliac crest, trochanters, sacrum, rib cage, skull, etc.), measuring several mm or cm in size, firm, smooth, round or oval, mobile or adherent to underlying tissue; single, or multiple and clustered

– Acute papular onchodermatitis: papular rash, sometimes diffuse but often confined to the buttocks or lower extremities, intensely itchy, associated with scratch marks, often superinfected (« filarial scabies »)[a]. This arises from dermal invasion by microfilariae.

[a] Differential diagnosis is sarcoptic scabies (Scabies, Chapter 4).

– Late chronic skin lesions: patchy depigmentation on the shins (« leopard skin »), skin atrophy or areas of dry, thickened, peeling skin (lichenification; “lizard skin”).
– Visual disturbances and ocular lesions: see Onchocerciasis, Chapter 5.

Laboratory

– Detection of the microfilariae in the skin (skin snip biopsy, iliac crest).
– If the skin biopsy is positive, look for loiasis in regions where loiasis is co-endemic (mainly in Central Africa).

Treatment

Antiparasitic treatment

– Diethylcarbamazine is contra-indicated (risk of severe ocular lesions).
– **Doxycycline** PO (200 mg/day for 4 weeks; if possible 6 weeks) kills a significant percentage of adult worms and progressively reduces the number of *O. volvulus* microfilariae[b]. It is contra-indicated in children < 8 years and pregnant or breast- feeding women.
– **Ivermectin** PO is the drug of choice: 150 micrograms/kg as a single dose; a 2nd dose should be administered after 3 months if clinical signs persist. Repeat the treatment every 6 or 12 months to maintain the parasite load below the threshold at which clinical signs appear[c]. Ivermectin is not recommended in children < 5 years or < 15 kg and pregnant women.
– In case of co-infection with *Loa loa* or in regions where loiasis is co-endemic, ivermectin should be administered with caution (risk of severe adverse reactions in patients with high *L. loa* microfilarial load):
  • If it is possible to test for Loa loa (thick blood film):
    Confirm and quantify the microfilaraemia. Administer the appropriate treatment according to the microfilarial load (see Loiasis, next page).
  • If it is not possible to perform a thick film examination, take a history from the patient:
    If the patient has received a previous treatment with ivermectin without developing serious adverse reactions (see page 169)), administer the treatment.
    If the patient has never received ivermectin nor developed signs of loiasis (migration of an adult worm under the conjunctiva, or « Calabar » swellings), administer the treatment.
    If the patient already has developed signs of loiaisis and if onchocerciasis has a significant clinical impact, administer ivermectin under close supervision (see Loiasis, next page) or use an alternative (doxycycline, as above).
– In the case of concomitant lymphatic filariasis: administer ivermectin first then start treatment for lymphatic filariasis with doxycycline PO (see Lymphatic filariasis) one week later.

Nodulectomy (surgical removal of onchocercomas)

Nodules are benign, often deep, and their ablation does not treat onchocerciasis. Thus, nodulectomy is reserved for cranial nodules (their proximity to the eye is a risk factor for visual compromise) or nodules which are cosmetically unacceptable. In other cases, refrain from nodulectomy. Nodulectomy is performed under local anaesthesia, in an appropriately equipped facility.

[b] Elimination of *Wolbachia* reduces the longevity and fertility of the macrofilariae, and thus the production of new microfilariae within the organism.

[c] Ivermectin kills microfilariae and disrupts production of microfilariae by adult worms. However the treatment must be administered at regular intervals since it does not kill adult worms.

Loiasis

The distribution of loiasis is linked to that of its vector (*Chrysops*) in forests or savannah with gallery forests in West or Central Africa (limits West: Benin; East: Uganda; North: Sudan and South: Angola).

Clinical features

- The subconjunctival migration of an adult worm is pathognomonic of *Loa loa* infection.
- Localised subcutaneous swellings, allergic in origin, transient (several hours or days), painless, non-pitting, appearing anywhere on the body, frequently the upper extremities and face, often associated with localised or generalised pruritus (« Calabar swellings »).
- Onset of pruritus, in the absence of other signs.
- Subcutaneous migration of an adult worm: pruritic, palpable red cord-like linear lesion, sinuous, advancing (1 cm/hour), disappearing rapidly with no trace[d]. Such migration generally arises following treatment with diethylcarbamazine, rarely spontaneously.

Laboratory

- Detection of microfilariae in the peripheral blood (thick film, stained with Giemsa). Blood specimens should be collected between 10 am and 5 pm. Quantify microfilaraemia even if the diagnosis is certain, since treatment is determined by the intensity of the parasite load.
- If the thick film is positive, look for onchocerciasis in regions where onchocerciasis is co-endemic (mainly in Central Africa).

Treatment

Antiparasitic treatment

- Diethylcarbamazine (DEC) is the only macrofilaricide available but is contra- indicated in:
  - Patients with microfilaraemia > 2000 mf/ml (risk of severe encephalopathy, with poor prognosis).
  - Patients co-infected with *O. volvulus* (risk of severe eye lesions).
  - Pregnant women, infants, and patients in poor general condition.
- Ivermectin (and possibly albendazole) is used to reduce microfilaraemia before administration of DEC; however, ivermectin administration may trigger encephalopathy in patients with very high *Loa loa* microfilaraemia (> 30 000 mf/ml).
- Doxycycline is not indicated since *Loa loa* does not harbour *Wolbachia*.

[d] For differential diagnosis, see cutaneous larva migrans, page 164.

– Management:

1) *L. loa microfilaraemia is < 1,000-2,000 mf/ml*
A 28-day treatment of **DEC** may be started using small doses of 3 to 6 mg/day, i.e. 1/32 or 1/16 of a 100 mg tablet, administered in 2 divided doses.
Double the dose every day up to 400 mg/day in 2 divided doses in adults (3 mg/kg/day in children).

   If microfilaraemia or symptoms persist, a second treatment is given 4 weeks later.

   If DEC is contra-indicated due to possible or confirmed co-infection with *O. volvulus*, **ivermectin** (150 micrograms/kg as a single dose) treats onchocerciasis, and reduces pruritus and frequency of Calabar swellings.

   The treatment may be repeated every month or every 3 months.

2) *L. loa microfilaraemia is between 2,000 and 8,000 mf/ml*
Reduce microfilaraemia with **ivermectin** (150 micrograms/kg as a single dose); repeat the treatment every month if necessary; administer DEC when the microfilaraemia is < 2000 mf/ml.

3) *L. loa microfilaraemia is between 8,000 and 30,000 mf/ml*
Treatment with **ivermectin** (150 micrograms/kg as a single dose) may cause marked functional impairment for several days. Close supervision and support from family member(s) are necessary[e]. Prescribe paracetamol as well for 7 days.

4) *L. loa microfilaraemia is > 30,000 mf/ml*
   - If the loiasis is well tolerated, it is preferable to refrain from treatment: the disease is benign and treatment with ivermectin may cause very severe adverse reactions (encephalopathy), albeit rarely.
   - If loiasis has a significant clinical impact and/or the patient presents with symptomatic onchocerciasis requiring treatment, **ivermectin** (150 micrograms/kg as a single dose) is administered for 5 days under supervision in hospital[f]. An attempt to first reduce *L. loa* microfilaraemia using **albendazole** (400 mg/day in 2 divided doses for 3 weeks) is an option. When *L. loa* microfilaraemia is < 30 000 mf/ml, treat with ivermectin under close supervision and support, then DEC when the microfilaraemia is < 2000 mf/ml.

Extraction of macrofilariae

Subcutaneous migration of a microfilaria usually results from treatment with DEC; the worm will die beneath the skin and extracting it serves no purpose.

Removal of an adult worm from the conjunctiva: see Loiasis, Chapter 5.

[e] Patients may present with various pain syndromes, be unable to move without help or unable to move at all. Monitoring is necessary to determine whether the patient can manage activities of daily living, and provide assistance if necessary. If the patient remains bedridden for several days, ensure pressure sores do not develop (mobilisation, repositioning).

[f] A severe reaction may occur on D2-D3. It is usually preceded by haemorrhages of the palpebral conjunctiva on D1-D2. Routinely check for this sign by turning back the eyelids. Symptoms of post-ivermectin encephalopathy are reversible and the prognosis favourable, if the patient is correctly managed; the treatment is symptomatic until symptoms resolve. Avoid the use of steroids due to adverse effects.

Lymphatic filariasis (LF)

The distribution of LF is linked to that of its mosquito vectors (Anopheles, Culex, Aedes, etc.):
– *W. bancrofti*: sub-Saharan Africa, Madagascar, Egypt, India, South East Asia, Pacific region, South America, The Caribbean
– *B. malayi*: South East Asia, China, India, Sri Lanka
– *B. timori*: Timor

90% of LF is due to *W. bancrofti* and 10% to *Brugia* spp.

Clinical features

– Acute recurrent inflammatory manifestations
  • Adenolymphangitis: lymph node(s) and red, warm, tender oedema along the length of a lymphatic channel, with or without systemic signs (e.g. fever, nausea, vomiting). The inflammation may involve the lower limbs, external genitalia and breast.
  • In men: acute inflammation of the spermatic cord (funiculitis), epididymis and testicle (epididymo-orchitis).

  Attacks resolve spontaneously within a week and recur regularly in patients with chronic disease.

– Chronic manifestations
  • Lymphoedema: oedema of the lower extremity or external genitalia or breast, secondary to obstruction of the lymphatics by macrofilariae. The oedema is reversible initially but then becomes chronic and increasingly severe: hypertrophy of the area affected, progressive thickening of the skin (fibrous thickening with formation of creases, initially superficial, but then deep, and verrucous lesions). The final stage of lymphoedema is elephantiasis.
  • In men: increase in volume of fluid due to accumulation within the tunica vaginalis (hydrocoele, lymphocoele, chylocoele); chronic epididymo-orchitis.
  • Chyluria: milky or rice-water urine (disruption of a lymphatic vessel in the urinary tract).

  In patients parasitized by *Brugia* spp, genital lesions and chyluria are rare: lymphoedema is usually confined to below the knee.

Laboratory

– Detection of microfilariae in the peripheral blood (thick film)[g]; blood specimens should be collected between 9 pm and 3 am.
– In regions where loiasis and/or onchocerciasis are co-endemic, check for co-infection if the LF diagnosis is positive.

Treatment

Antiparasitic treatment

– Treatment is not administered during an acute attack.

[g] When test results are negative in a clinically suspect case, consider detection of antigens (ICT rapid test) and/or ultrasound of the inguinal area in search of the « filarial dance sign ».

– **Doxycycline** PO, when administered as a prolonged treatment, eliminates the majority of macrofilariae and reduces lymphoedema: 200 mg/day for 4 weeks minimum. It is contra-indicated in children < 8 years and pregnant or breast-feeding women.
– **Diethylcarbamazine** PO as a single dose (400 mg in adults; 3 mg/kg in children) may be an alternative but eliminates a variable proportion of adult worms (up to 40%) and does not relieve symptoms; a prolonged treatment is no more effective than single dose therapy. In addition, DEC is contra-indicated in patients with onchocerciasis or *Loa loa* microfilarial load > 2000 mf/ml and in pregnant and breast-feeding women.
– Ivermectin (weak or absent macrofilaricidal effect) and albendazole should not be used for the treatment of individual cases (no effect on symptoms).
– In the case of confirmed or probable co-infection with *O. volvulus*: treat onchocerciasis first, then administer doxycycline.

Control/prevention of inflammatory manifestations and infectious complications

– Acute attacks: bed rest, elevation of the affected limb without bandaging, cooling of the affected limb (wet cloth, cold bath) and analgesics; antibacterial or antifungal cream if necessary; antipyretics if fever (paracetamol) and hydration.
– Prevention of episodes of lymphangitis and lymphoedema: hygiene of the affected extremity[h], comfortable footwear, immediate attention to secondary bacterial/fungal infections and wounds.
– Established lymphoedema: bandaging of the affected limb by day, elevation of the affected extremity (after removal of the bandage) when at rest, simple exercises (flexion-extension of the feet when recumbent or upright, rotation of the ankles); skin hygiene, as above.

Surgery

May be indicated in the treatment of chronic manifestations: advanced lymphoedema (diversion-reconstruction), hydrocoele and its complications, chyluria.

[h] Wash at least once daily (soap and water at room temperature), paying special attention to folds and interdigital areas; rinse thoroughly and dry with a clean cloth; nail care.

Chapter 7:
Bacterial diseases

Bacterial meningitis

Tetanus

Typhoid fever

Brucellosis

Plague

Leptospirosis

Relapsing fever (borreliosis)
- *Louse-borne relapsing fever (LBRF)*
- *Tick-borne relapsing fever (TBRF)*

Eruptive rickettsioses

Bacterial meningitis

Meningitis is an acute bacterial infection of the meninges, which may affect the brain and lead to irreversible neurological damage and auditory impairment.

Bacterial meningitis is a medical emergency. The treatment is based on early parenteral administration of antibiotics that penetrates well into the cerebrospinal fluid. Empiric antibiotic therapy is administered if the pathogen cannot be identified or while waiting for laboratory results.

The main bacteria responsible vary depending on age and/or context:

– Meningitis in a non-epidemic context:
  - Children 0 to 3 months:
    Children ≤ 7 days: Gram-negative bacilli (*Klebsiella* spp, *E. coli*, *S. marscesens*, *Pseudomona* spp, *Salmonella* spp) and group B streptococcus
    Children > 7 days: *S. pneumoniae* accounts for 50% of all bacterial meningitis
    L. monocytogenes is occasionally responsible for meningitis during this period.
  - Children 3 months-5 years: *S. pneumoniae*, *H. influenza B* and *N. meningitidis*
  - Children > 5 years and adults: *S. pneumoniae* and *N. meningitidis*

  Special conditions:
  - Immunodepressed patients (HIV, malnourished): high percentage of Gram- negative bacilli (specially *Salmonella* spp) and also M. tuberculosis.
  - Sickle cell anaemia: *Salmonella* spp and *Staphylococcus aureus* are frequent causes.
  - Meningitis may be related to *S. aureus* when associated with skin infection or skull fracture.

– Meningitis in an epidemic context:

  In the Sahelian region[a] during the dry season, epidemics of meningococcal meningitis (*Neisseria meningitidis* A or C or W135) affect children from 6 months of age, adolescents and adults. In these regions, whether during epidemics or not, all the above pathogens can be found, especially in young children.

Clinical features

The clinical presentation depends on the patient's age.

Children over 1 year and adults

– Fever, severe headache, photophobia, neck stiffness
– Brudzinski's sign (neck flexion in a supine patient results in involuntary flexion of the knees) and Kernig's sign (attempts to extend the knee from the flexed-thigh position are met with strong passive resistance).
– Petechial or ecchymotic purpura (usually in meningococcal infections)
– In severe forms: coma, seizures, focal signs, purpura fulminans

[a] But not exclusively, e.g. Rwanda, Angola, Brazil.

Children under 1 year

The classic signs of meningitis are usually absent.

– The child is irritable, appears sick with fever or hypothermia, poor feeding or vomiting.
– Other features include: seizures, apnoea, altered consciousness, bulging fontanelle (when not crying); occasionally, neck stiffness and purpuric rash.

Laboratory

– Lumbar puncture (LP):
  • Macroscopic examination of the cerebrospinal fluid (CSF): antibiotic therapy should be initiated immediately if the LP yields a turbid CSF.
  • Microscopic examination: Gram stain (but a negative examination does not exclude the diagnosis) and white blood cell count (WBC).
  • In an epidemic context, once the meningococcal aetiology has been confirmed, there is no need for routine LP for new cases.

	Pressure	Aspect	WBC (leucocytes/mm^3)	Protein	Other tests
Normal CSF		Clear	< 5	Pandy – < 40 mg/dl	–
Bacterial meningitis	++++	Cloudy, turbid	100-20 000 mainly neutrophiles In neonates: > 20 In immunocompromised, the WBC may be < 100	Pandy + 100-500 mg/dl	Gram stain +
Viral meningitis	Normal to +	Clear	10-700 mainly lymphocytes	Pandy –	–
TB meningitis	+++	Clear or yellowish	< 500 mainly lymphocytes	Pandy +	AFB
Cryptococcal meningitis	++++	Clear	< 800 mainly lymphocytes	Pandy –	India ink

– Rapid test for detection of bacterial antigens.

Note: in an endemic area, it is essential to test for severe malaria (rapid test or thin/thick films).

Treatment in a non-epidemic context

Antibiotic therapy

For the choice of antibiotic therapy and dosages according to age, see table next page.

Duration of antibiotic therapy:

1) According to the pathogen:
   - *Haemophilus influenzae*: 7 days
   - *Streptococcus pneumonia*: 10-14 days
   - Group B streptococcus and *Listeria*: 14-21 days
   - Gram-negative bacilli: 21 days
   - *Neisseria meningitidis*: see antibiotic therapy in an epidemic context

2) If the pathogen is unknown:

   Children < 3 months: 2 weeks beyond the first sterile CSF culture or 21 days
   Children > 3 months and adults: 10 days. Consider extending treatment or alternative diagnoses if fever persists beyond 10 days. On the other hand, a 7-day course of ceftriaxone is sufficient in patients who are making an uncomplicated recovery.

Additional treatment

– Dexamethasone reduces the risk of hearing loss in patients with *H. influenzae* or *S. pneumoniae*.
  Early administration in indicated in meningitis caused by these pathogens or when the pathogen is unknown, except in neonates (and in presumed meningococcal meningitis in an epidemic context).
  dexamethasone IV
  Children > 1 month and adults: 0.15 mg/kg (max. 10 mg) every 6 hours for 2 days
  The treatment should be started before or with the first dose of antibiotic, otherwise, the treatment offers no benefit.

– Ensure that the patient is well fed and well hydrated (infusions or nasogastric tube if necessary).

– Seizures (Chapter 1).

– Coma: prevention of bed sores, care of the mouth and eyes, etc.

	No associated skin infection		Associated skin infection (including umbilical cord infection)	
	First line	**Alternative**	**First line**	**Alternative**
0 to7 days < 2 kg	**ampicillin** IV 200 mg/kg/day in 2 divided doses + **cefotaxime** IV 100 mg/kg/day in 2 divided doses	**ampicillin** IV 200 mg/kg/day in 2 divided doses + **gentamicin** IV 3 mg/kg once daily	**cloxacillin** IV 100 mg/kg/day in 2 divided doses + **cefotaxime** IV 100 mg/kg/day in 2 divided doses	**cloxacillin** IV 100 mg/kg/day in 2 divided doses + **gentamicin** IV 3 mg/kg once daily
0 to 7 days ≥ 2 kg	**ampicillin** IV 300 mg/kg/day in 3 divided doses + **cefotaxime** IV 150 mg/kg/day in 3 divided doses	**ampicillin** IV 300 mg/kg/day in 3 divided doses + **gentamicin** IV 5 mg/kg once daily	**cloxacillin** IV 150 mg/kg/day in 3 divided doses + **cefotaxime** IV 150 mg/kg/day in 3 divided doses	**cloxacillin** IV 150 mg/kg/day in 3 divided doses + **gentamicin** IV 5 mg/kg once daily
8 days to < 1 month ≥ 2 kg	**ampicillin** IV 300 mg/kg/day in 3 divided doses + **cefotaxime** IV 150 mg/kg/day in 3 divided doses	**ampicillin** IV 300 mg/kg/day in 3 divided doses + **gentamicin** IV 5 mg/kg once daily	**cloxacillin** IV 200 mg/kg/day in 4 divided doses + **cefotaxime** IV 150 mg/kg/day in 3 divided doses	**cloxacillin** IV 200 mg/kg/day in 4 divided doses + **gentamicin** IV 5 mg/kg once daily
1 to 3 months	**ampicillin** IV 300 mg/kg/day in 4 divided doses + **ceftriaxone** IV 100 mg/kg on D1 then 100 mg/kg/day starting on D2 in 1 or 2 divided doses	**ampicillin** IV 300 mg/kg/day in 4 divided doses + **gentamicin** IV 7.5 mg/kg/day in 3 divided doses	**cloxacillin** IV 200 mg/kg/day in 4 divided doses + **ceftriaxone** IV 100 mg/kg on D1 then 100 mg/kg/day starting on D2 in 1 or 2 divided doses	**cloxacillin** IV 200 mg/kg/day in 4 divided doses + **gentamicin** IV 7.5 mg/kg/day in 3 divided doses
> 3 months and adults	**ceftriaxone** IV Children < 20 kg: 100 mg/kg on D1 then 100 mg/kg/day starting on D2 in 1 or 2 divided doses Children ≥ 20 kg and adults: 2 g/day		**cloxacillin** IV Children < 40 kg: 200 mg/kg/day in 4 divided doses Children ≥ 40 kg and adults: 8 to 12 g/day in 4 divided doses + **ceftriaxone** IV Children < 20 kg: 100 mg/kg on D1 then 100 mg/kg/day starting on D2 in 1 or 2 divided doses Children ≥ 20 kg and adults: 2 g/day	

Treatment in an epidemic context

Antibiotic therapy

In this context, *N. meningitidis* is the most likely pathogen.

Children under 2 months

ceftriaxone IV[b] or IM[c] for 7 days
100 mg/kg once daily

Children over 2 months and adults

ceftriaxone IV[b] or IM[c] for 5 days
Children 2 months to < 5 years: 100 mg/kg once daily (max. 2 g/day)
Children ≥ 5 years and adults: 2 g once daily

Note:
A short treatment with a single dose of ceftriaxone IM can be used in children 2 years and older, and in adults, if during a meningococcal meningitis epidemic confirmed by a reliable laboratory, the number of cases exceeds management capacities with the 5-day treatment. Check national recommendations. Nevertheless, it is essential to ensure a monitoring of cases after 24 hours.
ceftriaxone IM[c]
Children 2 to < 12 years: 100 mg/kg as a single dose
Children ≥ 12 years and adults: 4 g as a single dose
If there is no clinical improvement (fever > 38.5°C, repeated seizures, appearance or aggravation of a reduced level of consciousness or of neurological signs) 24 hours after the injection, continue the treatment with ceftriaxone for 5 days.

Additional treatment

- Ensure that the patient is well fed and well hydrated (infusions or nasogastric tube if necessary).
- Seizures (Chapter 1).
- Coma: prevention of bed sores, care of the mouth and eyes, etc.
- Dexamethasone in not indicated.

[b] The solvent of ceftriaxone for IM injection contains lidocaine. Ceftriaxone reconstituted using this solvent must never be administered by IV route. For IV administration, water for injection must always be used.

[c] For IM administration, divide the dose into 2 injections if needed, half-dose in each buttock.

Tetanus

Tetanus is a severe infection due to the bacillus *Clostridium tetani*, which is found in soil, and human and animal waste. The infection is noncontagious. *C. tetani* is introduced into the body through a wound and produces a toxin whose action on the central nervous system is responsible for the symptoms of tetanus.

Tetanus is entirely preventable by immunisation. It occurs in people who have not been fully immunized before exposure or have not received adequate post-exposure prophylaxis. In these individuals, most breaks in the skin or mucous membranes carry a risk of tetanus, but the wounds with the greatest risk are: the stump of the umbilical cord in neonates, puncture wounds, wounds with tissue loss or contamination with foreign material or soil, avulsion and crush injuries, sites of non-sterile injections, chronic wounds (e.g. lower extremity ulcers), burns and bites. Surgical or obstetrical procedures performed under non-sterile conditions also carry a risk of tetanus.

Clinical features

Generalised tetanus is the most frequent and severe form of the infection. It presents as muscular rigidity, which progresses rapidly to involve the entire body, and muscle spasms, which are very painful. Level of consciousness is not altered.

Children and adults

– Average time from exposure to onset of symptoms is 7 days (3 to 21 days).
– Muscular rigidity begins in the jaw muscles (difficulty with then inability to open mouth [trismus] preventing the patient from speaking, eating), spreading to the face (fixed smile), neck (difficulty with swallowing), to the trunk (restriction of respiratory muscles; hyperextension of spine [opisthotonus]), to the abdomen (guarding) and to the limbs (flexion of the upper limbs and extension of the lower limbs).
– Muscle spasms, which are very painful, appear at the onset or when muscular rigidity becomes generalised. They are triggered by stimuli (noise, light, touch) or arise spontaneously. Spasms of the thoracic and laryngeal muscles may cause respiratory distress or aspiration.

Neonates

– In 90% of cases, initial symptoms appear within 3 to 14 days of birth.
– The first signs are significant irritability and difficulty sucking (rigidity of the lips, trismus) then rigidity becomes generalised, as in adults. Any neonate, who initially sucked and cried normally, presenting with irritability and difficulty sucking 3 to 28 days after birth and demonstrating rigidity and muscle spasms should be assumed to have neonatal tetanus.

Treatment

Hospitalisation is needed and usually lasts 3 to 4 weeks. Correct management can reduce mortality even in hospitals with limited resources.

General measures

- Ensure intensive nursing care.
- The patient should be in a dark, quiet room. Blindfold infants with a cloth bandage.
- Handle the patient carefully, while sedated and as little as possible; change position every 3 to 4 hours to avoid bedsores.
- Teach family the danger signs and instruct them to call the nurse for the slightest respiratory symptom (cough, difficulty breathing, apnoea, excessive secretions, cyanosis, etc.).
- Establish IV access for hydration, IV injections.
- Gentle suction of secretions (mouth, oropharynx).
- Insert a nasogastric tube for hydration, feeding and administration of oral medications.
- Provide hydration and nutrition in feeds divided over 24 hours. In neonates, give expressed breast milk every 3 hours (risk of hypoglycaemia).

Neutralisation of toxin

human tetanus immunoglobulin IM
Neonates, children and adults: 500 IU as a single dose, injected into 2 separate sites

Inhibition of toxin production

metronidazole[a] IV infusion (30 minutes; 60 minutes in neonates) for 7 days
Neonates:
- 0 to 7 days: 15 mg/kg on D1 then, after 24 hours, 15 mg/kg/day in 2 divided doses
- 8 days to < 1 month (< 2 kg): same doses
- 8 days to < 1 month (≥ 2 kg): 30 mg/kg/day in 2 divided doses

Children 1 month and over: 30 mg/kg/day in 3 divided doses (max. 1.5 g/day)
Adults: 1.5 g/day in 3 divided doses

Control of rigidity and spasms, and sedation of the patient

Diazepam should decrease the frequency and intensity of spams without causing respiratory depression. The dose and frequency of administration depend on the patient's clinical response and tolerance.

⚠
- There is a high risk of respiratory depression and hypotension when using diazepam, especially in children and elderly patients. Constant and close monitoring of the patient's respiratory rate (RR) and oxygen saturation (SaO_2) is essential, with immediate availability of equipment for manual ventilation (Ambu bag, face mask) and intubation, suction (electric if possible) and Ringer lactate.
- A continuous IV infusion of diazepam requires the use of a dedicated vein (no other infusion/injection in this vein); avoid the antecubital fossa if possible.
- Do not stop treatment abruptly; an abrupt stop can cause tetanic spasms.

[a] Clindamycin IV for 7 days is an alternative (for doses, see Periorbital and orbital cellulitis, Chapter 5).

Neonates	**diazepam emulsion** for injection (10 mg vial, 5 mg/ml, 2 ml) • 0.1 to 0.3 mg/kg by slow IV injection (3 to 5 minutes) every 1 to 4 hours depending on the severity and the persistence of the spasms as long as the RR is ≥ 30. • If despite hourly diazepam the spasms persist, start a continuous infusion of diazepam with an electric syringe: 0.1 to 0.5 mg/kg/hour (2.4 to 12 mg/kg every 24 hours). Start with 0.1 mg/kg/hour and if symptoms persist, increase by 0.1 mg/kg/hour as long as RR is ≥ 30. • If in spite of 0.5 mg/kg/hour symptoms persist, the dose can be increased up to 0.8 mg/kg/hour as long as the RR ≥ 30. • Diluted diazepam emulsion does not keep for more than 6 hours. *Example:* *Neonate weighing 3 kg (administration by electric syringe)* *0.1 mg/kg/hour x 3 kg = 0.3 mg/hour* *Dilute one 10 mg vial of **diazepam emulsion** for injection in 50 ml of 10% glucose to obtain a solution containing 0.2 mg of diazepam per ml.* *Administer 1.5 ml/hour [dose (in mg/hour) ÷ dilution (in mg/ml) = dose in ml/hour i.e. 0.3 (mg/hour) ÷ 0.2 (mg/ml) = 1.5 ml/hour].* If an electric syringe is not available, diluting the diazepam emulsion in an infusion bag for continuous infusion may be considered. Weigh the risks associated with this mode of administration (accidental bolus or insufficient dose). The infusion should be monitored closely to avoid any change, however small, of the prescribed rate.
Children > 1month and adults	Same doses and protocol as in neonates but: • Use **diazepam solution** for injection 5 mg/ml: (10 mg vial, 5 mg/ml, 2 ml)[b]. • These doses can be administered as long as the RR is: ≥ 30 in children under 1 year ≥ 25 in children 1 to 4 years ≥ 20 in children 5 to 12 years ≥ 14 in children over 12 years ≥ 12 in adults *Examples:* • *Child weighing 6 kg (continuous IV infusion using a pediatric infusion set; 1 ml = 60 drops)* *0.1 mg/kg/hour x 6 kg = 0.6 mg/hour* *Dilute one 10 mg vial of **diazepam solution** for injection in 50 ml of 5% glucose (10% glucose if child < 3 months) to obtain a solution containing 0.2 mg of diazepam per ml.* *Administer 3 ml/hour [dose (in mg/hour) ÷ dilution (in mg/ml) = dose in ml/hour i.e. 0.6 (mg/hour) ÷ 0.2 (mg/ml) = 3 ml/hour] or 3 drops/minute (in a paediatric infusion set ml/hour = drops/minute).* • *Adult weighing 60 kg (standard adult infusion set, 1 ml = 20 drops)* *0.1 mg/kg/hour x 60 kg = 6 mg/hour* *Dilute 5 vials of 10 mg of **diazepam solution** (50 mg) in 250 ml of 0.9% sodium chloride or 5% glucose to obtain a solution containing 0.2 mg of diazepam per ml.* *Administer 30 ml/hour [dose (in mg/hour) ÷ dilution (in mg/ml) = dose in ml/hour e.g. 6 (mg/hour) ÷ 0.5 (mg/ml) = 30 ml/hour] or 10 drops/minute.*

Count the volume of the infusion of diazepam as part of the patient's daily fluid intake.

[b] Administer the first dose rectally if an IV cannot be placed immediately.

When the frequency and severity of the spasms have decreased, start weaning the diazepam (gradually decrease the rate of infusion):
- Calculate the total daily dose of IV diazepam and administer it orally in 4 divided doses, 6 hours apart, via nasogastric (NG)[c] tube.
- Give first NG dose and decrease rate of IV infusion by 50%.
- Give second NG dose and stop IV diazepam infusion.
- If withdrawal signs[d] appear, wean more slowly.
- Once on oral diazepam, wean by 10 to 20% of the original dose daily, until at a dose of 0.05 mg/kg every 6 hours.
- Then increase the interval from every 6 hours to every 8 hours for 24 hours as tolerated (wean more slowly if withdrawal signs appear).
- Continue to increase the interval between the doses from every 8 hours to every 12 hours and then to every 24 hours before stopping the diazepam.
- Each step should be for 24 hours or more if withdrawal signs appear.

Notes:
- It is often at these smaller doses that it is difficult to wean diazepam. If this is the case, slow the wean further: dropping the % wean (e.g. 5% wean every 24 hours instead of 10% wean) or increasing the interval between weans (e.g. going from every 24 hours to every 48 hours).
- If the patient is also receiving morphine, wean diazepam first then, wean morphine.
- Non-pharmacological measures to reduce withdrawal: reduce environmental stimuli; swaddle infants, frequent feedings.
- Infants who have had tetanus remain hypertonic, even when they are no longer having spams.

Treatment of pain

morphine PO (via NG tube) if necessary (see Pain, Chapter 1).

When morphine is administered with diazepam the risk of respiratory depression is increased, thus closer monitoring is required. When morphine is no longer required, wean the same way as diazepam.

Treatment of the point of entry

- Search systematically the entry wound. Provide local treatment under sedation: cleansing and for deep wounds, irrigation and debridement.
- Cord infection: do not excise or debride; treat bacterial omphalitis and sepsis, add to metronidazole IV: cloxacillin IV + cefotaxime IV or cloxacillin IV + gentamicin IV (for doses, see Bacterial meningitis).

Tetanus vaccination

As tetanus does not confer immunity, immunisation against tetanus must be administered once the patient has recovered.
In case of neonatal tetanus, initiate the immunisation of the mother.

[c] Administration of oral diazepam tablets to infants: calculate the exact dose of diazepam, e.g. to obtain 0.5 mg of diazepam, cut a scored diazepam 2 mg tablet in half along scoring then split in half again. Crush quarter tablet and dissolve in expressed breast milk or infant formula.

[d] Withdrawal signs: excessive irritability, tremors, increased muscle tone, frequent yawning, poor feeding, watery stools and sweating.

Prevention

Of critical importance, given the difficulty of treating tetanus once established.

1) Post-exposure prophylaxis

– In all cases:
  • Cleansing and disinfection of the wound, and removal of any foreign body.
  • Antibiotics are not prescribed routinely for prophylaxis. The decision to administer an antibiotic (metronidazole or penicillin) is made on a case-by-case basis, according to the patient's clinical status.

– Depending on pre-exposure vaccination status:
  • Tetanus vaccine (TV)[e] and immunoglobulin: see indications below.

Risk	**Complete immunisation** (3 or more doses) Time since administration of latest dose: < 5 years	5-10 years	> 10 years	**Incomplete immunisation** (less than 3 doses) or **no immunisation** or **unknown status**
Minor clean wound	None	None	TV one booster dose	Initiate or complete TV
All other wounds	None	TV one booster dose	TV one booster dose	Initiate or complete TV and administer tetanus immunoglobulin

tetanus vaccine IM
Children and adults: 0.5 ml/injection
If no immunisation or unknown immunisation status: administer at least 2 doses at an interval of 4 weeks.
If incomplete immunisation: administer one dose.
Then, to ensure long-lasting protection, administer additional doses to complete a total of 5 doses, as indicated in the table on next page.

human anti-tetanus immunoglobulin IM
Children and adults: 250 IU as a single dose; 500 IU for wounds more than 24 hours old.
Inject the vaccine and the immunoglobulin in 2 different sites, using a separate syringe for each.

2) Routine immunisation (pre-exposure prophylaxis)

– Children: 5 doses in total: a first series of 3 doses of DTP or DTP + HepB or DTP + Hib + HepB before the age of 1 year, administered at an interval of 1 month (e.g. at the age of 6, 10 and 14 weeks), then a 4th dose of a vaccine containing tetanus toxoid between the ages of 4 to 7 years, then a 5th dose between 12 and 15 years.

– Women of childbearing age: 5 doses during the reproductive years: a series of 3 doses (dT or TT) with an interval of at least one month between the 1st and 2nd dose and an interval of at least 6 months between the 2nd and 3rd dose, then two other doses, each at minimum interval of one year, e.g. during pregnancies (see table on next page).

[e] Tetanus-containing vaccine, such as TT or DT or dT or DTP or DTP + HepB or DTP + Hib + HepB according to availability and patient's age.

– Pregnant women: if a woman has never been immunized or if her immunisation status is unknown: 2 doses of dT or TT during the pregnancy to reduce the risk of tetanus in mother and newborn: the first as soon as possible during the pregnancy and the second at least 4 weeks later and at least 2 weeks before delivery. This immunisation schedule protects more than 80% of newborns from neonatal tetanus. A single dose offers no protection

Dose	Vaccination schedule in adults	Degree and duration of protection
TV1	On first contact with the health care system or as soon as possible during pregnancy	No protection
TV2	At least 4 weeks after TV1	80% 1 to 3 years
TV3	6 months to 1 year after TV2 or during the following pregnancy	95% 5 years
TV4	1 to 5 years after TV3 or during the following pregnancy	99% 10 years
TV5	1 to 10 years after TV4 or during the following pregnancy	99% Throughout the reproductive years

Typhoid fever

Systemic infection due to *Salmonella typhi*. The organism enters the body via the gastrointestinal tract and gains access to the bloodstream via the lymphatic system. Typhoid fever is acquired by ingestion of contaminated water and food or by direct contact (dirty hands).

Clinical features

- Sustained fever (lasting more than one week), headache, asthenia, insomnia, anorexia, epistaxis.
- Abdominal pain or tenderness, diarrhoea or constipation, gurgles.
- Toxic confusional state, prostration.
- Moderate splenomegaly, relative bradycardia (normal pulse despite fever).
- *Differential diagnosis* may be difficult as symptoms resemble those of lower respiratory tract infections, urinary infections, and malaria or dengue fever in endemic areas.
- *Complications* can occur during the active phase or during convalescence (even during treatment): intestinal perforation or haemorrhage, peritonitis, myocarditis, encephalitis, coma.

Laboratory

- Relative leukopenia (normal white blood cell count despite septicaemia).
- Isolation of *S. typhi* from blood cultures (take at least 10 ml of blood) and stool cultures during the first 2 weeks.
- Widal's agglutination reaction is not used (both sensitivity and specificity are poor).

Treatment (at hospital level)

- Isolate the patient.
- Keep under close surveillance, hydrate, treat fever (Chapter 1).
- Antibiotic therapy: case-fatality rates of 10% can be reduced to less than 1% with early antibiotic treatment based on the findings of blood cultures. The oral route is more effective than the parenteral route. If the patient cannot take oral treatment, start by injectable route and change to oral route as soon as possible.
  - *Antibiotic treatment (except during pregnancy or breast-feeding)*
    - The treatment of choice is:
      ciprofloxacin PO for 5 to 7 days
      Children: 30 mg/kg/day in 2 divided doses (usually not recommended in children under 15 years, however, the life-threatening risk of typhoid outweighs the risk of adverse effects)
      Adults: 1 g/day in 2 divided doses
      cefixime PO for 7 days may be an alternative to ciprofloxacin in children under 15 years:
      Children over 3 months: 20 mg/kg/day in 2 divided doses

Failing that, and in the absence of resistance:
amoxicillin PO for 14 days
Children: 75 to 100 mg/kg/day in 3 divided doses
Adults: 3 g/day in 3 divided doses
or
chloramphenicol PO for 10 to 14 days depending on severity
Children from 1 year to less than 13 years: 100 mg/kg/day in 3 divided doses
Children ≥ 13 years and adults: 3 g/day in 3 divided doses

- *S. typhi* is rapidly developing resistance to quinolones. In this event, use:
ceftriaxone[a,b] IM or slow IV (3 minutes) or infusion (30 minutes) for 10 to 14 days depending on severity
Children: 75 mg/kg once daily
Adults: 2 to 4 g once daily

• *Antibiotic treatment in pregnant or breast-feeding women*

In pregnant women, typhoid carries a major risk of maternal complications (intestinal perforation, peritonitis, septicaemia) and foetal complications (miscarriage, premature delivery, intrauterine death).

- In the absence of resistance:
amoxicillin PO: 3 g/day in 3 divided doses for 14 days
- If resistance:
ceftriaxone as above for 10 to 14 days
Failing that, use ciprofloxacin PO (usually not recommended for pregnant or breast-feeding women. However, the life-threatening risk of typhoid outweighs the risk of adverse effects). For dosage, see above.

Note: fever persists for 4 to 5 days after the start of treatment, even if the antibiotic is effective. It is essential to treat the fever and to check for possible maternal or foetal complications.

– In patients presenting severe typhoid, with toxic confusional state (hallucinations, altered consciousness) or intestinal haemorrhage:
dexamethasone IV: loading dose 3 mg/kg and then 1 mg/kg every 6 hours for 2 days

Prevention

– Disinfection of faeces with 2% chlorine solution.
– Individual (hand washing) and collective hygiene (safe water supply, sanitation).
– The possibility of vaccination must be considered: it can be useful in some situations (high-risk age group, hyperendemic zone), but its effectiveness remains controversial.

[a] The solvent of ceftriaxone for IM injection contains lidocaine. Ceftriaxone reconstituted using this solvent must NEVER be administered by IV route. For IV administration, water for injection must always be used.

[b] Doses of ceftriaxone greater than 1 g IM should be administered in 2 equally divided injections (one in each buttock). Doses greater than 2 g should be administered by IV infusion only.

Brucellosis

– A zoonosis that mainly affects domestic animals. It is occasionally transmitted to man by ingestion of infected raw milk, or by contact (with infected animals or with soiled objects through abrasion on the skin). Human-to-human transmission is rare.
– A Brucellosis is caused by Gram-negative bacilli of the genus *Brucella*: *B. melitensis* (sheep and goats), *B. abortus* (cattle), *B. suis* (pigs) and less commonly, *B. canis* and *B. ovis*.
– A The disease is found worldwide and mainly in rural areas. The true incidence of brucellosis in tropical countries is probably underestimated as it is often undiagnosed.

Clinical features

The clinical signs and associated symptoms are fluctuating and non specific. Diagnosis is difficult because of the broad spectrum of clinical manifestations.

Acute form

– Common form: gradual onset over one to 2 weeks: undulant fever (up to 39-40°C) lasting 10 to 15 days, night sweats, chills, asthenia, joint and muscle pain. Possible sacroileitis, arthritis (knee) and orchitis.
  In regions where malaria is endemic, the possibility of acute brucellosis should be considered when a high fever persists despite correct anti-malarial treatment.
– Other clinical forms:
  • Typhoid-like form: sudden onset with signs of septicaemia; high fever, typhoid state, delirium, abdominal signs.
  • Subacute form: mild, non-specific clinical signs that do not lead the patient to seek medical attention. Serum test positive.

Secondary brucellosis

Prolonged asthenia, focal signs:
– Bone and joint involvement: arthritis of the hip, sacroileitis, spondylitis with sciatalgia (pseudo-Pott's disease).
– Neurobrucellosis: pseudo-tuberculosis meningitis, meningoencephalitis; a complication at vertebral site involving peripheral nerves may cause motor and/or sensory disorders.

Chronic brucellosis

– General signs; physical and mental asthenia, sweating and polyalgia.
– Focal signs: slow developing bone, neuromeningeal or visceral foci.

Laboratory

– During the acute phase diagnosis can be confirmed by the detection of the pathogen in a blood culture.
– The Rose Bengal test (or ring test) can identify specific antibodies. It is a quick, cheap and both specific and sensitive test for the diagnosis of acute and localized forms of brucellosis.
– Other serological tests (Wright's test, ELISA, indirect immunfluorescence and Coombs’test) cannot usually be done.

Treatment

Treatment is based on a combination of 2 antibiotics. Since streptomycin and rifampicin are also used in the treatment of tuberculosis, it is essential to rule out the possibility of active TB before starting treatment (patient history, clinical examination and chest X-ray if possible). Rifampicin must only be used when indicated below.

Acute form

– Children over 8 years and adults (except in pregnant or breast-feeding women)
doxycycline PO
Children: 100 to 200 mg once daily or in 2 divided doses for 6 weeks
Adults: 200 mg once daily or in 2 divided doses for 6 weeks
+ **streptomycin** IM
Children: 15 mg/kg once daily for 2 weeks
Adults: 1 g once daily for 2 weeks

– Children under 8 years
cotrimoxazole PO: 40 mg SMX + 8 mg TMP/kg/day in 2 divided doses for 6 weeks
+ **gentamicin** IM: 7.5 mg/kg once daily or in 2 divided doses for 2 weeks
or **rifampicin** PO: 15 mg/kg once daily for 6 weeks

– Pregnant or breast-feeding women
cotrimoxazole PO: 1600 mg SMX + 320 mg TMP/day in 2 divided doses for 6 weeks
+ **rifampicin** PO: 600 mg once daily for 6 weeks

Note:
In pregnant women, the combination of cotrimoxazole + rifampicin can be administered regardless of the stage of pregnancy if treatment is indispensable.
Administration of vitamin K is recommended to prevent neonatal and maternal haemorrhage.
phytomenadione (vial containing 10 mg/ml, 1 ml):
To the mother: 10 mg/day PO for the 15 days preceding the expected date of delivery
To the newborn: 2 mg PO as a single dose at birth and again after 4 to 7 days

Focal brucellosis

– Same treatment regimen as for the acute form, but for a period of 6 weeks to 3 months depending on severity. Surgical draining of an abscess of the liver or spleen may be indicated.
– Neurobrucellosis or endocarditis: combination of rifampicin + doxycycline + gentamicin. Antibiotic treatment is not effective in the context of chronic, non-focal brucellosis.

Prevention

– Washing of hands and clothing if in contact with animals.
– Boil milk and avoid eating raw cheese and undercooked meat.

Plague

– A zoonosis caused by the Gram-negative bacillus *Yersinia pestis* that mainly affects wild and domestic rodents.
– Plague is transmitted to man by the bite of an infected flea vector or through a break in the skin by contact with a rodent. Human-to-human transmission occurs through the bites of human fleas, or, in the case of pneumonic plague, by inhaling infected droplets expelled by coughing.
– Vast foci of infection remain in Central and Southeast Asia, Africa, Madagascar, and in North and South America.

Clinical features and progress

There are 3 main clinical forms:

– *Bubonic plague* is the most common form: high fever, chills, headache, associated with one (or more) very painful lymph node, usually inguinal (bubo). Frequent gastrointestinal signs: abdominal pain, vomiting, diarrhoea, etc. The mortality rate in untreated patients is approximately 50% as a result of septicaemia.
– *Septicaemic plague* is a complication of untreated bubonic plague and is a fulminant illness.
– *Pneumonic plague* is a very contagious form: high fever, chills, headache, myalgia associated with paroxysmal coughing, haemoptysis and respiratory distress. This form progresses rapidly, and is fatal unless treated. It occurs either as a complication of bubonic plague or as the result of a primary infection.

Occasionally, the disease can take the form of *meningitic plague*.

Laboratory

– Isolation of *Y. pestis* (direct examination and culture) from lymph node aspirate, blood, sputum, cerebrospinal fluid, depending on the form involved.
– Serodiagnosis: ELISA reads positive soon after the onset of the illness.
– Transportation of the samples requires a cold chain (failing that, the temperature must be kept below 30°C).

Management and treatment

– When plague is suspected: take samples for cultures and antibiotic sensitivity testing and then treat immediately without waiting for the diagnosis to be confirmed. Inform the health authorities as soon as the diagnosis has been confirmed.

– Isolation:
  • Patients suffering from bubonic plague do not have to be isolated. Treat the patient and his/her bedding and clothing with an insecticide (e.g. **permethrin 0.5%** powder; see Pediculosis, Chapter 4). Observe elementary rules of hygiene (wash hands, wear gowns, gloves etc.).
  • Patients with primary or secondary pneumonic plague must be strictly isolated. Their bedding, clothing, sputum and excreta must be disinfected with a chlorinated solution. Observe elementary rules of hygiene (wash hands, wear hospital lab coats, gloves etc.) and both the patient and carers should wear facemasks.

Treatment of suspected or confirmed cases

If treatment is begun early, recovery is rapid and complete. Penicillins, cephalosporins and macrolides should not be used.
Aminoglycosides, tetracyclines, chloramphenicol and sulphonamides are effective. Follow national recommendations. For information:

streptomycin IM for 10 days
Children: 30 mg/kg/day in 2 divided doses given at 12 hour-intervals
Adults: 2 g/day in 2 divided doses given at 12 hour-intervals

gentamicin IM for 10 days
Neonates and children under one year: 7.5 mg/kg/day in 2 divided doses
Children over one year: 6 mg/kg/day in 2 divided doses
Adults: 3 mg/kg/day in 2 divided doses

doxycycline PO for 10 days
Children over 8 years and adults: 200 mg/day, once daily or in 2 divided doses

chloramphenicol PO or IV for 10 days
Children from 1 year to less than 13 years: 50 to 100 mg/kg/day in 3 divided doses
Children ≥ 13 years and adults: 3 g/day in 3 divided doses

Choice of antibiotics

Indications	First choice	Alternative
Bubonic plague	doxycycline	chloramphenicol or streptomycin
Pneumonic plague	streptomycin	–
Septicaemic plague	streptomycin	chloramphenicol
Meningitic plague	chloramphenicol	–
Pregnant or breast-feeding women	gentamicin	–

Note: in order to prevent the emergence of resistance to streptomycin which is used in the treatment of tuberculosis, it is preferable to use doxycycline or chloramphenicol for the treatment of bubonic plague.

Chemoprophylaxis of contacts

In the event of contact, and within one week after the end of exposure:
doxycycline PO throughout the period of contact (minimum 5 days of treatment)
Children over 8 years and adults: 100 to 200 mg/day, once daily or in 2 divided doses
or
co-trimoxazole PO throughout the period of contact (minimum 5 days of treatment)
Children: 40 mg SMX + 8 mg TMP/kg/day in 2 divided doses
Adults: 1600 mg SMX + 320 mg TMP/day in 2 divided doses

Prevention

- Flea vector control is essential to controlling an epidemic.
- Long-term prevention: environmental sanitation and control of rodent reservoir.
- Vaccination against plague is only indicated for people with a high risk of exposure (laboratory technicians handling rodents) and can in no circumstances be used as a method for controlling an epidemic.

Leptospirosis

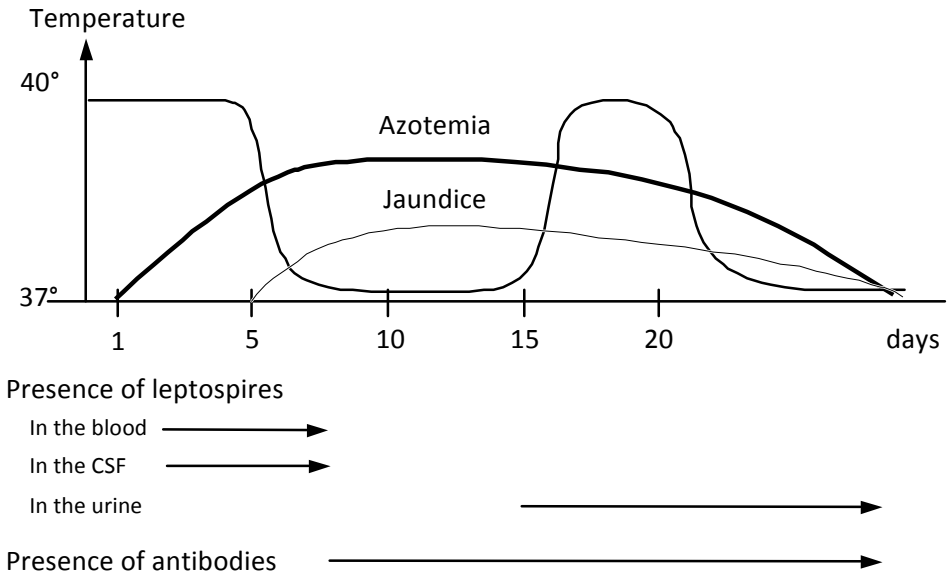
– A zoonosis caused by spirochetes of the genus *Leptospira*, affecting many domestic and wild animals (particularly rodents and principally rats).
– Leptospirosis is acquired by indirect contact (contact of the skin or mucous membranes with animal urine-contaminated water, e.g. when swimming) and less commonly, by direct contact with infected animals.

Clinical features

Diagnosis is difficult because of the broad spectrum of clinical manifestations. A distinction is usually made between the mild form (the most common, usually with a favourable outcome) and the severe form (multiple organ dysfunction syndrome).

– *Mild form*
  • After an incubation period of one to 3 weeks: influenza-like illness (high fever, chills, headache, myalgias), often combined with gastrointestinal disorders (anorexia, abdominal pain, nausea, vomiting) and possible pulmonary signs (cough, chest pain). Other signs: conjunctival haemorrhage, hepatosplenomegaly, and multiple adenopathies. Mild jaundice may be present, but this form is usually anicteric.
  • The signs regress after 5 to 6 days, and then reappear, sometimes with meningeal invasion, which may be complicated by encephalitis or myelitis.
– *Severe form or Weil's syndrome*
  The onset of the disease is the same as in mild form. After a few days, acute hepatorenal manifestations with fever, jaundice, oligo-anuric renal failure; diffuse haemorrhagic syndrome (purpura, ecchymoses, epistaxis etc.), pulmonary signs (cough, chest pain, haemoptysis) and cardiac signs (myocarditis, pericarditis).

Temperature chart and progress of leptospirosis



Laboratory

– Isolation through culture of leptospires from blood, cerebrospinal fluid (during the first phase) or urine (during the second phase).
– Serodiagnosis: immunofluorescence or ELISA (antibodies are detected from Day 8).
– Blood cell count: polymorphonuclear leukocytosis.
– If meningeal syndrome: lumbar puncture yields a clear fluid, usually with raised leucocyte count and elevated protein level (about 1 g/litre).
– Urine: proteinuria, leukocyturia, possible haematuria and presence of casts.

Treatment

– Rest and treatment of fever: paracetamol PO (Chapter 1).
Acetylsalicylic acid (aspirin) is contraindicated (risk of haemorrhage).

– Antibiotic treatment should be started as soon as possible:

  • *Moderate form*
  amoxicillin PO
  Children: 50 mg/kg/day in 2 divided doses for 7 days
  Adults: 2 g/day in 2 divided doses for 7 days
  or
  doxycycline PO (except in pregnant or breast-feeding women and children under 8 years)
  Children over 8 years: 100 mg/day in 2 divided doses for 7 days
  Adults: 200 mg/day in 2 divided doses for 7 days
  or
  erythromycin PO
  Children: 30 to 50 mg/kg/day in 2 or 3 divided doses for 7 days
  Adults: 2 to 3 g/day in 2 or 3 divided doses for 7 days

  • *Severe form*
  ceftriaxone IV[a]
  Children: 80 to 100 mg/kg once daily for 7 days (max. 2 g/day)
  Adults: 2 g once daily for 7 days

Prevention

– Avoid bathing in endemic areas.
– Rodent control, environmental sanitation (particularly water).
– Vaccination is restricted to personnel exposed in the course of their work.

[a] For IV administration of ceftriaxone, use only water for injection as solvent.

Relapsing fever (borreliosis)

Relapsing fever (FR) is caused by spirochetes of the genus *Borrelia*, transmitted to humans by arthropod vectors.

Louse-borne relapsing fever (LBRF)

LBRF is caused by *Borrelia recurrentis*. It occurs in epidemic waves when conditions favourable to the transmission of body lice are met: cold climate/season, overcrowding and very poor sanitation (e.g. refugee camps, prisons). Endemic foci of LBRF are mainly the Sudan and the Horn of Africa (especially Ethiopia). LBRF can be associated with louse-borne typhus (see Eruptive rickettsioses). The mortality rate for untreated LBRF ranges from 15 to 40%.

Clinical features

- Relapsing fever is characterized by febrile episodes separated by afebrile periods of approximately 7 days (4 to 14 days).
- The initial febrile episode lasts up to 6 days:
  - Sudden onset of high fever (> 39°C), severe headache and asthenia, diffuse pain (muscle, joint, back pain), often associated with gastrointestinal disturbances (anorexia, abdominal pain, vomiting, diarrhoea).
  - Splenomegaly is common; bleeding signs (e.g. petechiae, subconjunctival haemorrhage, epistaxis, bleeding gums), jaundice or neurological symptoms may be observed.
  - The febrile episode terminates in a crisis with an elevation in temperature, pulse and blood pressure, followed by a fall in temperature and blood pressure, which may last for several hours.
- Following the initial febrile episode, the cycle usually reccurs; each episode is less severe than the previous one and the patient develops temporary immunity.
- Complications:
  - collapse during defervescence, myocarditis, cerebral haemorrhage;
  - during pregnancy: abortion, preterm delivery, in utero foetal death, neonatal death.

In practice, in an applicable epidemiological setting (see above), a suspect case of LBRF is, according to the WHO, *a patient with high fever and two of the following symptoms: severe joint pain, chills, jaundice or signs of bleeding (nose or other bleeding) or a patient with high fever who is responding poorly to antimalarial drugs*. Clothing should be checked for the presence of body lice and nits.

Laboratory

The diagnosis is confirmed by detection of *Borrelia* in thick or thin blood films (Giemsa stain). Blood samples must be collected during febrile periods. Spirochetes are not found in the

peripheral blood during afebrile periods. In addition, the number of circulating spirochetes tends to decrease with each febrile episode.

Treatment

- Antibiotic therapy (suspect or confirmed cases and close contacts):
  doxycycline PO[a]
  Children: 100 mg as a single dose
  Adults: 100 or 200 mg as a single dose
  or
  erythromycin PO
  Children ≤ 5 years: 250 mg as a single dose
  Children > 5 years and adults: 500 mg as a single dose
- Treatment of pain and fever (paracetamol PO) and prevention or treatment of dehydration in the event of associated diarrhoea.
- Elimination of body lice is essential in control of epidemics (see Pediculosis, Chapter 4).

Tick-borne relapsing fever (TBRF)

TBRFs are caused by different *Borrelia* species. They are endemic in temperate and warm regions of the word, especially in Africa (Tanzania, DRC, Senegal, Mauritania, Mali, the Horn of Africa) and mainly in rural areas. TBRF is a major cause of morbidity and mortality in children and pregnant women. The mortality rate for untreated TBRF ranges from 2 to 15%.

Clinical features

The clinical manifestations and complications of TBRF are similar to those of LBRF but neurological symptoms (particularly, cranial nerve palsies and lymphocytic meningitis) are more frequent than in LBRF and the number of relapses is higher.

The clinical diagnosis is difficult, especially during the first episode: cases occur sporadically rather than in outbreaks; the tick bite is painless and usually unnoticed by the patient; symptoms are very similar to those of malaria, typhoid fever, leptospirosis, certain arbovirosis (yellow fever, dengue) or rickettsiosis, and meningitis.

Laboratory

- As for LBRF, the diagnosis is confirmed by detection of *Borrelia* in the patient's blood.
- Repeat the examination if the first smear is negative despite strong clinical suspicion.

[a] Doxycycline is usually contra-indicated in children under 8 years and pregnant women. However, if erythromycin is not available, it may be used for the treatment of LBRF, the administration of a single dose should not cause any adverse effects.

Treatment

– Antibiotic therapy:
  doxycycline PO
  Children over 8 years: 100 mg/day in 2 divided doses for 7 days
  Adults (except pregnant women): 200 mg/day in 2 divided doses for 7 days
  or
  erythromycin PO
  Children under 8 years: 50 mg/kg/day in 2 divided doses for 7 days
  Pregnant women: 2 g/day in 2 divided doses for 7 days
– Treatment of pain and fever (paracetamol PO) and prevention or treatment of dehydration in the event of associated diarrhoea.

⚠ Antibiotic therapy can trigger a Jarisch-Herxheimer reaction with high fever, chills, fall in blood pressure and sometimes shock. It is recommended to monitor the patient for 2 hours after the first dose of antibiotic, for occurrence and management of severe Jarisch-Herxheimer reaction (symptomatic treatment of shock). Jarisch-Herxheimer reaction appears to occur more frequently in LBRF than in TBRF.

Eruptive rickettsioses

Eruptive fevers caused by bacteria of the genus *Rickettsia* and transmitted to man by an arthropod vector. Three main groups are distinguished: typhus group, spotted fever group and scrub typhus group.

Clinical features

See next page.

Laboratory

Detection of specific IgM of each group by indirect immunofluorescence. The diagnosis is confirmed by 2 serological tests at an interval of 10 days. In practice, clinical signs and the epidemiological context are sufficient to suggest the diagnosis and start treatment.

Treatment

- Symptomatic treatment:
  - Hydration (PO or IV if the patient is unable to drink).
  - Fever: paracetamol PO (Chapter 1). Acetylsalicylic acid (aspirin) is contra- indicated due to the risk of haemorrhage.
- Antibiotic therapy[a] for 5 to 7 days or until 3 days after the fever has disappeared:
  doxycycline PO (except in pregnant or lactating women)
  Children < 45 kg: 4 mg/kg/day in 2 divided doses
  Children ≥ 45 kg and adults: 200 mg/day in 2 divided doses
- In pregnant or breast-feeding women:
  josamycin PO[b]: 3 g/day in 3 divided doses for 8 days
- In a context of *epidemic typhus*, **doxycycline** PO 200 mg as a single dose is the choice treatment, but there is a risk of recurrence.
  Note: doxycycline is usually contraindicated in pregnant or breast-feeding women. However, the administration of a single dose should not, in theory, provoke adverse effects. Check national recommendations.

Prevention

- Epidemic typhus: control of body lice (see Pediculosis, Chapter 4).
- Murine typhus: control of fleas and then rats.
- Spotted fevers: avoid tick bites by wearing clothing and using repellents.
- Scrub typhus: use of repellents, chemoprophylaxis with **doxycycline** PO (200 mg once weekly in adults).

[a] Unlike borrelioses, antibiotic treatment of rickettsioses does not provoke a Jarisch-Herxheimer reaction. However, the geographical distribution of borrelioses and rickettsioses may overlap, and thus a reaction may occur due to a possible co-infection (see Borreliosis).

[b] Only some macrolides can be used. Erythromycin is not effective.

Clinical features

– Common to all forms:
  - Sudden onset of fever (temperature of over 39°C) with severe headache and myalgias.
  - 3 to 5 days later; onset of generalised cutaneous eruption (see below).
  - Hypotension; non-dissociated rapid pulse (variable).
  - Typhoid state: prostration, omnubilation, confusion and extreme asthenia, particularly marked in typhus forms.
  - Inoculation eschar: painless, black crusted lesion surrounded by a erythematous halo at the site of the bite. Always check for this significant sign.
  - Non-cutaneous signs vary from one form to another, and are atypical and variable (see below).

Group	Typhus		Spotted fever			Scrub typhus
Form	Epidemic typhus	Murine typhus	Mediterranean spotted fever	Rocky Mountain spotted fever	Other Old-World tick-borne fevers	Scrub typhus
Pathogen	*R. prowasekii*	*R. typhi*	*R. conorii*	*R. rickettsii*	*R. sibirica, R. australis*	*O. tsutsugamushi*
Vector	body lice	rat fleas	ticks	ticks	ticks	mites
Reservoir	**man**	rats	dogs	rodents	rodents, dogs, etc.	rodents
Occurence	**epidemic**	endemic	endemic	endemic	endemic	sporadic
Geographical distribution	worldwide, conflicts; main sites: Burundi/Rwanda, Ethiopia	worldwide	around the mediterranean, Sub-Saharan Africa	North America, Central America, Columbia, Brazil	Southern Africa, Australia, Siberia	Extrême-Orient, Inde, Pacifique Sud
Rash	maculopapular	maculopapular	maculopapular	purpural	maculopapular	macular
Eschar	0	0	**black necrotic area**	rare	**black necrotic area**	**black necrotic area**
Typhoid state	+++	+++	+/-	+/-	+/-	+++
Extra-cutaneous signs	cough, myalgia, meningeal signs	gastrointestinal signs	meningeal signs	gastrointestinal and neurological signs, hypotension	variables	meningeal signs
Case fatality (%)	30 (without treatment)	5	2	5	1	0-30

– Complications can be severe, and sometimes fatal: encephalitis, myocarditis, hepatitis, acute renal failure, haemorrhage etc.

Chapter 8: Viral diseases

Measles

Poliomyelitis

Rabies

Viral hepatitis

Dengue

Viral haemorrhagic fevers

HIV infection and AIDS

Measles

Measles is a highly contagious acute viral infection, transmitted by the airborne route (inhalation of respiratory droplets spread by infected individuals). The disease mainly affects children under 5 years of age and can be prevented by immunization.
For more information, refer to the MSF handbook *Management of a measles epidemic*.

Clinical features

The average incubation period is 10 days.

Prodromal or catarrhal phase (2 to 4 days)

– High fever (39-40°C) with cough, coryza (nasal discharge) and/or conjunctivitis (red and watery eyes).
– Koplik's spots: tiny bluish-white spots on an erythematous base, found on the inside of the cheek. This sign is specific of measles infection, but may be absent at the time of examination. Observation of Koplik's spots is not required for diagnosing measles.

Eruptive phase (4 to 6 days)

– On average 3 days after the onset of symptoms: eruption of erythematous, non- pruritic maculopapules, which blanch with pressure. The rash begins on the forehead then spreads downward to the face, neck, trunk (2nd day), abdomen and lower limbs (3rd and 4th day).
– As the rash progresses, prodromal symptoms subside. In the absence of complications, the fever disappears once the rash reaches the feet.
– The rash fades around the 5th day in the same order that it appeared (from the head to the feet).

The eruptive phase is followed by skin desquamation during 1 to 2 weeks, very pronounced on pigmented skin (the skin develops a striped appearance).

In practice, a patient presenting with fever and erythematous maculopapular rash and at least one of the following signs: cough or coryza or conjunctivitis, is a clinical case of measles.

Complications

Most measles cases experience at least one complication:
– Respiratory and ENT: pneumonia, otitis media, laryngotracheobronchitis
– Ocular: purulent conjunctivitis, keratitis, xerophthalmia (risk of blindness)
– Gastrointestinal: diarrhoea with or without dehydration, benign or severe stomatitis
– Neurological: febrile seizures; rarely, encephalitis
– Acute malnutrition, provoked or aggravated by measles (post-measles period)

Pneumonia and dehydration are the most common immediate causes of death.

Case management

– Admit as inpatient children with at least one major complication:
  • Inability to eat/drink/suck, or vomiting
  • Altered consciousness or seizures
  • Dehydration
  • Severe pneumonia (pneumonia with respiratory distress or cyanosis or O_2 sat. < 90%)
  • Acute laryngotracheobronchitis (croup)[a]
  • Corneal lesions (pain, photophobia, erosion or opacity)
  • Severe oral lesions that prevent eating
  • Acute malnutrition
– Treat as outpatient children with no major complications, no complications or minor complications:
  • Pneumonia without severe signs
  • Acute otitis media
  • Purulent conjunctivitis (no corneal lesions)
  • Diarrhoea without dehydration
  • Oral candidiasis that does not interfere with eating

  If in doubt, keep the child under observation for a few hours.
– Isolation
  • Isolation of hospitalised patients
  • Measles cases treated as out-patients should be kept at home during this period.

Treatment

Supportive and preventive treatment

– Treat fever: paracetamol (Fever, Chapter 1).
– Make the child drink (high risk of dehydration).
– Give smaller, more frequent meals or breastfeed more frequently (every 2 to 3 hours).
– Clear the nasopharynx (nose-blowing or nasal lavages) to prevent secondary respiratory infection and improve the child's comfort.
– Clean the eyes with clean water 2 times daily and administer retinol on D1 and D2 (see page 128, Chapter 5) to prevent ocular complications.
– In children under 5 years: amoxicillin PO for 5 days as a preventive measure (reduction of respiratory and ocular infections).
– In the event of watery diarrhoea without dehydration: oral rehydration according to WHO *Plan A* (Appendix 2).
– Insert a nasogastric tube for a few days if oral lesions prevent the child from drinking.

Treatment of complications

See following page.

[a] Symptoms (hoarse crying or voice, difficulty breathing, a high-pitched inspiratory wheeze [inspiratory stridor], characteristic "barking" cough) are caused by inflammation and narrowing of the larynx. Croup is considered benign or "moderate" if the stridor occurs when the child is agitated or crying, but disappears when the child is calm. The child should be monitored during this period, however, because his general and respiratory status can deteriorate rapidly. Croup is severe when the stridor persists at rest or is associated with signs of respiratory distress.

	Treatment of complications
Severe pneumonia	**ceftriaxone** IV or IM + **cloxacillin** IV then change to **amoxicillin/clavulanic acid** PO (see pages 73-74, Chapter 2) + **oxygen** if cyanosis or O_2 saturation < 90% + **salbutamol** if expiratory wheezing and sibilant rales on auscultation In all cases, close monitoring.
Pneumonia without severe signs	**amoxicillin** PO for 5 days
Croup	Inpatient monitoring (risk of worsening). Keep the child calm. Agitation and crying exacerbate the symptoms. For severe croup: **dexamthasone** IM: 0.6 mg/kg single dose + nebulized **epinephrine** (adrenaline, 1 mg/ml ampoule): 0.5 ml/kg (max. 5 ml) + **oxygen** if cyanosis or O_2 saturation < 90% Intensive monitoring until symptoms resolve.
Acute otitis media	See Otitis, Chapter 2.
Dehydration	Rehydration according to WHO *Plan B* or *C.*
Oral candidiasis	See Stomatitis, Chapter 3.
Purulent conjunctivitis	See Conjunctivitis, Chapter 5.
Keratitis/ keratoconjunctivitis	**tetracycline 1% eye ointment** 2 times daily for 7 days + **retinol** PO one dose on D1, D2 and D8 (see Xerophthalmia, Chapter 5) + eye protection and **tramadol** PO from 6 months of age (see Pain, page 31, Chapter 1). No topical corticosteroids.
Xerophthalmia	See Xerophthalmia, Chapter 5.
Febrile seizures	See Seizures, Chapter 1.

Prevention

– No chemoprophylaxis for contacts.

– Vaccination:
  - The first dose is administered at 9 months of age. In situations where there is high risk of infection (overcrowding, epidemics, malnutrition, infants born to a mother with HIV infection, etc.): administer one dose at 6 months of age (between 6 and 8 months) and one dose at 9 months of age, with an interval of at least 4 weeks between injections.
  - Children must receive a second dose before they are 5 years old in order to cover unvaccinated children or children who did not respond to the first dose.

Poliomyelitis

- Poliomyelitis is an acute viral infection due to a poliovirus (serotypes 1, 2 and 3). Human-to-human transmission is direct (faecal-oral) or indirect (ingestion of food and water contaminated by stool). Humans are the only reservoir of the virus. In principle the disease can be eradicated by mass vaccination.
- In endemic areas, epidemics usually affect children under 5 years of age.
  In non- endemic areas, where vaccination coverage is low, young adults are most commonly affected.

Clinical features

- In more than 90% of cases, infection is asymptomatic.
- *Non-paralytic form:* a non-specific febrile illness with muscle pain, headache, vomiting, backache; no neurological involvement.
  As spontaneous recovery usually occurs within 10 days, diagnosis is rarely made outside epidemic contexts.
- *Paralytic form:* in less than 1% of cases, after the non-specific signs, the patient develops rapid onset (from the morning to the evening) asymmetrical acute flaccid paralysis, predominantly of the lower limbs, with ascending progression. The muscles become soft with diminished reflexes. Sensation is maintained. The disease is life threatening if paralysis involves the respiratory muscles or muscles of swallowing. Initial urinary retention is common. Gastrointestinal disturbances (nausea, vomiting, diarrhoea), muscle pain and meningeal symptoms may also occur.

Laboratory

Look for the polio virus in stool samples. The virus is excreted for one month after infection, but only intermittently; therefore, 2 samples must be collected with an interval of 48 hours.

Treatment

- Hospitalise patients with the paralytic form: rest, prevent bed sores in bedridden patients, give analgesics (do not give IM injections to patients in the febrile phase), ventilate patients with respiratory paralysis.
- Physiotherapy once the lesions are stable to prevent muscle atrophy and contractures.
- Care for sequelae: physiotherapy, surgery and prosthetics.

Patients with acute flaccid paralysis (AFP)

- Consider all patients with AFP as suspected cases of poliomyelitis.
- Confirm the diagnosis by isolating the virus: send the 2 stool samples to a reference laboratory, with a clinical description of the patient. The stool samples must be stored and transported between 0°C and 8°C.

– While waiting for laboratory confirmation, vaccinate all children under 5 years of age living in the area (from the same village or neighbouring villages), irrespective of their vaccination status.
– Once the case is confirmed, organize a mass vaccination campaign: the area and the age group are determined as a function of epidemiological data.
– Surveillance: for each case of AFP there are between 100 and 200 subclinical cases. Therefore, active surveillance to detect new cases is essential for epidemic control.

Prevention

– 2 types of vaccines exist:
  • a trivalent injectable inactivated poliovirus vaccine (IPV),
  • a bivalent oral live attenuated poliovirus vaccine (bOPV).
– Vaccination schedule: depends on the epidemiology of the virus.
  Protocols vary according to the country, follow national recommendations. For information, the WHO recommends:

Schedule	Primary vaccination	
	Endemic or at risk zones*	Other zones
Birth	1 dose bOPV**	–
6 weeks	1 dose bOPV	1 dose bOPV
10 weeks	1 dose bOPV	1 dose bOPV
14 weeks	1 dose bOPV + 1 dose IVP	1 dose bOPV + 1 dose VPI

* Countries where poliomyelitis is endemic or zones at high risk of importation and subsequent spread of the virus.
** The 1st dose of bOPV is administered at birth, or as soon as possible, to optimise seroconversion rates after subsequent doses and induce mucosal protection.

In children who start routine vaccination late (after the age of 3 months), the dose of IPV is administered together with the 1st dose of bOPV, followed by 2 doses of bOPV alone administered 4 weeks apart.

There is also an 'IPV only' schedule: 3 doses administered 4 weeks apart (e.g. at 6, 10 and 14 weeks) and a booster dose at least 6 months later.
IPV should eventually completely replace bOPV.

Rabies

Rabies is a viral infection of wild and domestic mammals, transmitted to humans by the saliva of infected animals through bites, scratches or licks on broken skin or mucous membranes. Any mammal can transmit rabies, but the great majority of human cases are due to dog bites.
Once symptoms develop, rabies presents as a fatal encephalitis. There is no curative treatment; care is palliative. Before symptomatic disease has developed, rabies can effectively be prevented by post- exposure prophylaxis.

Clinical features

– The incubation period averages 20 to 90 days from exposure (75% of patients), but can be shorter (in severe exposure, i.e. bites to face, head and hands, multiple bites), or longer (20% of patients develop symptoms between 90 days and 1 year, and 5% more than 1 year after exposure).
– Prodromal phase: itching or paraesthesiae around the site of exposure, and non- specific symptoms (malaise, fever, etc.).
– Neurologic phase:
  • Furious form: psychomotor agitation or hydrophobia (throat spasms and panic, triggered by attempting to drink or sight/sound/touch of water) and aerophobia (similar response to a draft of air); sometimes seizures. The patient is calm and lucid between episodes.
  • Paralytic form (less common, 20% of cases): progressive ascending paralysis resembling Guillain-Barré syndrome.

Diagnosis is often difficult: there may be no history of scratch or bite (exposure through licking) or wounds may have healed; a reliable history may be difficult to obtain.

Post-exposure prophylaxis

Risk of rabies virus infection: definition of exposure categories (WHO)

Category I	Contact with animal, or licks on intact skin	**No exposure**
Category II	Nibbles on exposed skin Minor bite(s) or scratch(es) without bleeding	**Minor exposure**
Category III	Transdermal bite(s) or scratch(es) Licks on broken skin Contamination of mucous membranes by animal's saliva (licks) Exposure to bat[a]	**Severe exposure**

Post-exposure prophylaxis is carried out for Category II and III exposures.

[a] In the case of direct contact with bats, check national recommendations.

Treatment of the wound

– *In all cases*

Prolonged cleansing of the wound or contact site to eliminate the virus, as soon as possible after exposure, is of critical importance. For skin: use soap, rinse copiously with running water, remove all foreign material; application of polyvidone iodine 10% or ethanol 70% is an additional precaution which does not take the place of wound washing. For mucous membranes (eye, mouth, etc.): rinse thoroughly with water or 0.9% sodium chloride. Local cleansing is indicated even if the patient presents late.

– *According to condition/type of wound*

In order to avoid inoculating virus deeper into the tissues, wounds are either not sutured at all (e.g. superficial, non-mutilating or puncture wounds), or are left open and re-evaluated in 48-72 hours, with a view to possible closure. Highly contaminated wounds, or wounds that may compromise function, require surgical management (exploration, removal of foreign material, excision of necrotic tissue, copious irrigation with 0.9% sodium chloride or Ringer lactate, with local or general anaesthesia). When suturing is unavoidable, rabies immune globulin should be administered several hours or days before wound closure (see below). Infected wounds are not sutured and reassessed daily.

Passive and active immunisation

Given the variable duration of incubation, administration of vaccine/immune globulin is an urgent priority, even for patients exposed several months previously.

– *Administration of rabies immune globulin*

Rabies immune globulin (RIG) is indicated for Category III exposures[b], and Category II and III exposures in immune-compromised patients.
RIG is intended to neutralize virus in the exposure site. It is given as a single dose on D0, with the first dose of rabies vaccine.
Children and adults: **human rabies immune globulin**, 20 IU/kg, or **highly purified equine immune globulin derivative F(ab')2**, 40 IU/kg.
Infiltrate as much of the dose as possible in and around the wounds(s)[c]. Inject any residual product, using the IM route, in a site remote from that used for vaccination. In the event of multiple wounds, dilute the dose 2- to 3-fold with sterile 0.9% sodium chloride to obtain a sufficient quantity to infiltrate all the sites exposed.
If RIG is not available on D0, the first dose of rabies vaccine is administered alone. RIG can still be given as soon as possible within the next few days. However, RIG is no longer recommended when 7 or more days have elapsed since the first dose of vaccine was given, as vaccine-induced immunity will have developed by this time.

[b] Unless it can be established that the patient has been correctly vaccinated against rabies before exposure (complete pre-exposure vaccination with 3 doses of a CCV).

[c] Infiltrate RIG, even if the wound has healed. For finger wounds, infiltrate very cautiously to avoid causing a compartment syndrome. When it is not possible to infiltrate the wound (mucous membranes), the entire dose is administered IM.

– *Post-exposure rabies vaccination*

A complete rabies vaccination series is indicated for Category II and III exposures. It should be started on D0 and continued to completion if the risk of rabies has not been excluded[d]. Several different types of rabies vaccine are available. Vaccines prepared from cell culture (CCV), e.g. human diploid cells (HDCV), Vero cells (PVRV) or chick embryo cells (PCECV) must replace nerve tissue vaccines (NTV). There are several possible vaccination protocols: check and follow national recommendations. The shortest regimens among those endorsed by the WHO are shown as examples:

Post-exposure vaccination regimens

	No pre-exposure vaccination or Unknown vaccination status or Incomplete pre-exposure vaccination or Complete pre-exposure vaccination with a NTV		**Complete pre-exposure vaccination with a CCV**
	Intramuscular (IM) 2-0-1-1 Administer in the deltoid muscle (anterolateral thigh in children < 2 years), never in the gluteal muscle One IM dose = 0.5 or 1 ml (depending on the manufacturer)	**Intradermal (ID)* 2-2-2-0-2** Use only PVRV or PCECV vaccine One ID dose = 0.1 ml	**IM or ID* 1-1** One IM dose = 0.5 or 1 ml (depending on the manufacturer) One ID dose = 0.1 ml
D0	2 doses (one dose in each arm or thigh)	2 doses (1 dose in each arm)	1 dose
D3		2 doses (1 dose in each arm)	1 dose
D7	1 dose (in the arm or thigh)	2 doses (1 dose in each arm)	
D21	1 dose (in the arm or thigh)		
D28		2 doses (1 dose in each arm)	
	+ RIG on Day 0, if indicated		*No RIG*

* Incorrect ID technique results in failure of PEP: if correct ID technique cannot be assured, use the IM regimen.

[d] Either through observation of the captured animal (if domestic) or through laboratory diagnosis of the animal (killed). The WHO recommends a 10-day observation period of the animal, if captured. If no signs of rabies develop during the observation period, the risk of rabies is excluded, and rabies vaccination is discontinued. Laboratory diagnosis of the dead animal involves sending the head to a specialised laboratory, which confirms or excludes rabies in the animal. If laboratory diagnosis is negative, risk of rabies is excluded, and rabies vaccination is discontinued.

Other measures

– *Antibiotic therapy or prophylaxis*

- A 7-day course of antibiotics is indicated for infected wounds (redness, oedema, purulent or serosanguinous drainage, localised cellulitis, lymphangitis, lymphadenopathy, fever). A longer treatment and/or the parenteral route may be indicated in severe infection.
- Antibiotic prophylaxis (5 to 7 days) is recommended for deep puncture wounds, wounds on the face or hands, wounds involving joints, tendons, ligaments or fractures; very contaminated wounds or those requiring debridement; in immune- compromised patients.
- Antibiotic prophylaxis is not recommended for superficial wounds or wounds more than 24-48 hours old in patients showing no local or general signs of infection.
- The same dosage is used for both treatment and prophylaxis:
  amoxicillin/clavulanic acid (**co-amoxiclav**) PO[e] (dosage expressed in amoxicillin):
  - Children < 40 kg: 45 to 50 mg/kg/day in 2 divided doses (if using ratio 8:1 or 7:1) or in 3 divided doses (if using ratio 4:1)
    The dose of clavulanic acid should not exceed 12.5 mg/kg/day or 375 mg/day.
  - Children ≥ 40 kg and adults: 1500 to 2000 mg/day depending on the formulation available:
    Ratio 8:1: 2000 mg/day = 2 tablets of 500/62.5 mg 2 times per day
    Ratio 7:1: 1750 mg/day = 1 tablet of 875/125 mg 2 times per day
    Ratio 4:1: 1500 mg/day = 1 tablet of 500/125 mg 3 times per day
    The dose of clavulanic acid should not exceed 375 mg/day.

– *Tetanus vaccination and immune globulin*

Verify vaccination status. If unknown or not up-to-date, see Tetanus, Chapter 7.

[e] Co-amoxiclav is the antibiotic of choice. **Doxycycline** (200 mg/day in 2 divided doses) may be used in penicillin-allergic patients, except in pregnant women and children < 8 years.

Viral hepatitis

– Several viral infections of the liver are grouped under the heading of viral hepatitis: hepatitis A, B, C, Δ (delta) and E.
– The different hepatitis viruses are present throughout the world, but their prevalence varies by country. Hepatitis A and B are common in developing countries where nearly the entire population is infected during childhood or adolescence.
– The clinical characteristics of all five diseases are similar enough to make differential diagnosis difficult; however, there are epidemiological, immunological and pathological differences. Patients with hepatitis B, C and Δ may later develop chronic liver disease or even hepatocellular carcinoma.
– The main characteristics of each type of viral hepatitis are summarized in a table on the next page.

Clinical features

– *Asymptomatic forms*
Mild or anicteric forms are the most common, irrespective of the causal virus. The risk of developing later complications from hepatitis B, C and Δ are the same as for symptomatic patients.
– *Classic forms*
Insidious or sudden onset with symptoms of varying intensity: fever, fatigue, nausea, gastrointestinal disturbance, followed by jaundice, dark coloured urine and more or less clay-coloured stool.
– *Fulminant forms*
Hepatocellular failure with severe, often fatal, cytolysis. This form is most frequent in hepatitis B patients with secondary infection with the Δ virus, and in pregnant women infected with hepatitis E during their third trimester (20% mortality).
– *Chronic hepatitis*
Hepatitis B, C and Δ may lead to cirrhosis or hepatoma.

Main profiles observed in different clinical scenarios during HBV infection

Ag HBs	anti-HBs antibodies	anti-HBc antibodies	anti-HBc IgM	Ag HBe	anti-HBe antibodies	HBV DNA	Interpretation
+	(–)	(–)	+	(+)	(–)	(+)	Acute hepatitis
+/–	–	+	–	–	+/–	–	Acute hepatitis, recovery phase
–	+/–	+	–	–	–	–	Post-infectious immunity (cured)
+	–	+	+/–	+	–	+	Chronic hepatitis (wild virus)
–	+	–	–	–	–	–	Post-vaccination immunity

The tests in parentheses are not useful for diagnosis.

The various forms of viral hepatitis

	Hepatitis A	Hepatitis B	Hepatitis C	Hepatitis Δ	Hepatitis E
Age group most at risk	Children	Young adults	Young adults	Young adults	Young adults
Transmission	Faecal-oral Contaminated food and water Transfusion (rare)	Blood and blood products Sexual Material contaminated with blood Vertical (mother-to-child)	Blood and blood products Sexual: low Material contaminated with blood (low) Probably vertical	Blood and blood products Sexual Material contaminated with blood Possibly vertical	Faecal-oral Contaminated food and water
Incubation period	2 to 6 weeks	4 to 30 weeks (average 10 weeks)	2 to 25 weeks	Co-infection B/Δ: as for hepatitis B Secondary infection of hepatitis B: approximately 5 weeks	2 to 8 weeks
Period of communicability	Precedes signs. Brief: < 10 days after the appearance of jaundice Most infectious at the end of incubation period.	Precedes signs and lasts entire active period. Can persist in chronic carriers.	Precedes signs. Duration is not well known, probably the same as for hepatitis B. Could persist beyond normalisation of transaminases.	Precedes signs. Duration is not well known, probably the same as for hepatitis B.	Precedes signs. Duration is not well known (10 to 15 days after the appearance of jaundice)
Fulminant forms	0.2 to 0.4%	1 to 3%	More rare than in hepatitis B	Much more common in patients with secondary infection of hepatitis B than in patients with B/Δ co-infection	20% mortality in pregnant women
Prognosis	No chronic forms	Chronicity: 0.2 to 10% of which 5 to 15% progress to cirrhosis. Hepatoma possible	Chronicity: up to 50%, of which 10 to 25% progress to cirrhosis. Hepatoma possible	Chronicity: 2 to 5% for patients with B/Δ co- infection; > 90% if secondary infection of hepatitis B (rapid cirrhosis)	No chronic forms
Individual prevention	Polyvalent immunoglobulin	Specific anti-HBs immunoglobulin Safe sex (condoms)	Specific anti-HBs immunoglobulin may be effective	As for hepatitis B (the Δ virus can only develop with B)	Does not exist
Vaccination	Anti-hepatitis A	Anti-hepatitis B	Does not exist	Anti-hepatitis B	Does not exist
Collective prevention	Hygiene, sanitation	Limit transfusion, screen blood prior to transfusion Single use of disposable material			Hygiene, sanitation

Treatment

– Rest, hydration, no special diet.
– Drug therapy for symptomatic treatment (analgesics, antipyretics, antidiarrhoeals, antiemetics etc.) during the acute phase is contra-indicated as it may aggravate symptoms and the evolution of hepatitis. Corticosteroids are not indicated.

Vaccination

Only against hepatitis A and B. Vaccination against hepatitis B is included in the EPI of some countries.

IM vaccination against hepatitis B:

– *Standard schedule*
  • Newborns, infants
    In countries where perinatal infection is common: one injection after birth, then at 6 and 14 weeks
    Where perinatal infection is less common: one injection at 6, 10 and 14 weeks
  • Children, adolescents, adults
    Schedule 0-1-6: 2 injections 4 weeks apart, then a 3rd injection 5 months after the 2nd injection
– *Accelerated schedule*, when rapid protection is required (imminent departure in highly endemic areas, post-exposure prophylaxis)
  Schedule D0-D7-D21: 3 injections administered during the same month, then a 4th injection one year after the 1st injection

Dengue

– Dengue fever is an arbovirus transmitted to humans by the bite of a mosquito (*Aedes*). Transmission by transfusion of contaminated blood and transplacental transmission to the foetus have also been reported.
– Four different serotypes of dengue have been described. Infection with one serotype provides a lifelong immunity to that specific serotype, but only partial, short-term immunity to other serotypes. There is no specific antiviral treatment.
– Dengue is a mainly urban disease, present in tropical and subtropical regions, in particular in Asia, Central and South America and the Caribbean. Outbreaks have been described in Eastern Africa.
– Primary infection may be asymptomatic or present as mild dengue fever. Subsequent infections increase the risk of severe dengue.

Clinical features

After the incubation period (4 to 10 days), the illness occurs in 3 phases:
– *Febrile phase*: high fever (39° to 40°C) lasting 2 to 7 days, often accompanied by generalized aches, a maculopapular rash and mild haemorrhagic manifestations.
– *Critical phase* (between the 3rd and 7th day): decrease in temperature. The majority of patients will have dengue without warning signs and proceed to the recovery phase.
Certain patients will develop dengue with warning sign(s) or severe dengue.
– *Recovery phase*: patient improves, vital signs normalise, gastrointestinal symptoms subside and appetite returns. At times, bradycardia and generalized pruritus.

Symptoms according to severity (adapted from the WHO)	
Dengue without warning signs	Fever + 2 of the following symptoms: • Nausea, vomiting • Rash resembling measles • Generalized aches (headache, retro-orbital pain, myalgias, arthralgias) • Benign mucocutaneous bleeding (petechiae, positive tourniquet test[a], epistaxis, gingival bleeding) • Leucopenia
Dengue with warning signs	Presence of at least one of these symptoms: • Abdominal pain • Persistent vomiting • Fluid accumulation (ascites, pleural effusion) • Mucosal bleeding • Hepatomegaly (> 2 cm) • Agitation or lethargy • Increasing haematocrit and rapidly dropping platelet count
Severe dengue	• Severe plasma leakage with: - Fluid accumulation (ascites, pleural effusion) + respiratory distress - Compensated shock: weak and rapid pulse, hypotension, cold extremities, capillary refill time > 2 seconds - Decompensated shock: pulse and blood pressure unrecordable • Severe mucocutaneous bleeding • Multiorgan failure e.g.: hepatic or cardiac failure, obtundation, coma

[a] Tourniquet test: inflate a blood pressure cuff on the upper arm to a point midway between the systolic and diastolic pressure for 5 min. The test is positive when 20 or more petechiae per 2.5 cm square are observed.

Major differential diagnoses

Malaria, influenza, measles, Chikungunya, mononucleosis, primary HIV-infection, sepsis, meningococcemia, typhoid fever, viral haemorrhagic fever, leptospirosis.

Laboratory

Diagnostic

– Rapid diagnostic test (serum, plasma or whole blood) detects NS1 viral antigen during the febrile phase and IgM and IgG antibodies during the critical and recovery phases.
– This test indicates the likely presence of an infection with dengue virus but the results must be confirmed by molecular techniques (PCR) in a reference laboratory.

Monitoring the haematocrit (Hct) and complete blood count

– The haematocrit (and not the haemoglobin) is the only test that shows haemoconcentration or increased vascular permeability (plasma leakage). The Hct reflects disease evolution and suggests therapeutic response.
– In children and pregnant women and if possible, in all patients, measure a reference Hct (Hct 0) at the first visit (during the febrile phase or before the critical phase).
– Measure baseline Hct on admission before administering fluid boluses (Hct 1) for all patients in Groups B and C then monitor Hct to determine therapy.
– An increase in the Hct with a rapid drop in the platelet count (≤ 100 000/mm^3) is a warning sign.
– In case of hemodynamic instability or signs of shock:
  • An increased or a persistently high Hct (> 50% in men or an increase relative to the previous Hct in women and children) indicates severe plasma leakage;
  • A decrease in Hct (< 40-45% in men, < 35-40% in women and children 1 year and older, < 30-35% in children under 1 year) may indicate a haemorrhage.
– Leukopenia (< 5 000/mm^3) is frequent.

Treatment of patients in Group A

Patients with no warning signs, able to drink sufficiently and with a normal urine output.

– Treat as outpatients, bed rest and good hydration.
– Fever: paracetamol PO at the usual doses (see Fever, Chapter 1), maintaining a strict 6 to 8 hour interval between doses. Do not prescribe acetylsalicylic acid, ibuprofen or other non-steroidal anti-inflammatory drugs.
– Seek medical attention if: no clinical improvement, persistent vomiting, cold extremities, agitation or lethargy, breathing difficulties or absence of urine output.
– If follow-up is impossible or symptoms cannot be monitored at home (patients living far from the health care facility/living alone), hospitalise for observation.

Treatment of patients in Group B

Patients with warning sign(s) or co-morbidities (e.g. diabetes mellitus, hypertension, cardiac or renal failure, sickle cell anaemia) or at risk populations (pregnant women, infants, the elderly, patients with difficulty drinking).

In all cases:

– Hospitalise; place the patient under a mosquito net.
– Measure Hct 1 and baseline platelet count.
– Avoid invasive procedures (nasogastric tube, IM injections) to minimize the risk of bleeding.
– Fever: paracetamol PO as in Group A. In case of hepatitis, administer with caution and decrease the dose (children: 30 mg/kg/day in 3 divided doses; adults: 1.5 g/day in 3 divided doses; maintaining a strict 8-hour interval between doses).

If warning signs or dehydration:

– Place an intravenous line and start hydration with Ringer lactate.
– Monitor the Hct every 4 to 6 hours until the patient is stabilized.
– The volume and rate of Ringer lactate administration is determined by the vital signs: heart rate (HR), blood pressure (BP) and by the evolution of the Hct. See Table 1 – Group B: dengue with warning signs or dehydration.
– Monitor fluid balance: intake (IV and oral) and output (urine).
– Monitor urine output every 4 hours: administer the volume of IV fluids necessary to ensure that the urine output is at least 1 ml/kg/hour in children and 0.5 ml/kg/hour in adults. If unavailable, ensure that the patient is urinating at least every 4 hours.

Treatment of patients in Group C

Patients with severe dengue requiring emergency treatment.

In all cases:

– Hospitalise in intensive care; place the patient under a mosquito net.
– Administer oxygen (O_2) continuously:
  • to maintain the SaO_2 between 94 and 98% if it is ≤ 90%[b] or if the patient has cyanosis or respiratory distress;
  • if pulse oxymeter is not available: at least 5 litres/minute or to relieve the hypoxia and improve respiration.
– Before first bolus, measure Hct 1, baseline platelets count and blood group, then monitor the Hct every 1 to 4 hours until the patient is stabilized.
– Check for the presence of the shock: rapid and weak pulse, low BP or narrow pulse pressure, cold extremities, capillary refill time > 2 seconds.
– Mark the size of the liver with a pen on admission.
– The volume and rate of Ringer lactate or plasma substitute administration is determined by the vital signs (HR, BP) and by the evolution of the Hct. See Table 2 – Group C: dengue with compensated shock or Table 3 – Group C: dengue with decompensated shock.
– Monitor urine output: same monitoring as in Group B.
– Monitor signs of fluid overload (especially in children):
  • Increase in RR ≥ 10/minute or tachypnoea;
  • Increase in HR ≥ 20/minute or tachycardia and SaO_2 < 90%;
  • Rales and/or pulmonary oedema (fine crackles);
  • Gallop rhythm on cardiac auscultation;
  • Increase in liver size;
  • Peripheral oedema (e.g. eyelid oedema).

[b] If possible it is better to treat all patients with a SaO_2 < 95% with oxygen.

– In case of fluid overload, stop the IV infusion if vital signs are stable.
– In case of respiratory distress with rales, administer furosemide IV (see Heart failure, Chapter 12) if the patient is not in shock.
– Avoid invasive procedures (nasogastric tube, IM injections) to minimize the risk of bleeding.
– Transfuse patients with fresh whole blood[c] in case of significant bleeding or if a low Hct does not improve with resuscitation. The post-transfusion Hct should be interpreted with caution.
– When the patient improves, stop the IV infusion to avoid fluid overload.

Prevention

– Individual protection: long sleeves and trousers, repellents, mosquito net (*Aedes* bites during the day).
– A dengue vaccine is not yet available.

[c] Fresh whole blood: that has never been refrigerated, that has never kept at a temperature below 16°C and collected from the donor for less than 6 hours.

<table>
<tr><th colspan="3">Table 1 – Group B: dengue with warning signs or dehydration</th></tr>
<tr><td colspan="3">Measure Hct 1 then
Children and adults:
Ringer lactate
5-7 ml/kg/h for 1-2 h
3-5 ml/kg/h for 2-4 h
2-3 ml/kg/h for 2-4 h or less depending on clinical response</td></tr>
<tr><td colspan="3">• Re-evaluate the clinical signs (vital signs, capillary refill time, urine output) hourly and measure Hct 2 then repeat the Hct every 4-6 hours or more if necessary.
• Adjust the rate of the IV infusion in order to maintain a urine output of 1-2 ml/kg/h in children and 0.5 ml/kg/h in adults.</td></tr>
<tr><td rowspan="3">Hct 2 identical to Htc 1
or minimally increased

Children and adults:
Ringer lactate
2-3 ml/kg/h for 2-4 h</td><td colspan="2">Hct 2 increased relative to Hct 1 and/or tachycardia and/or hypotension (if shock: see Group C)
Children and adults:
Ringer lactate
5-10 ml/kg/h for 1-2 h</td></tr>
<tr><td colspan="2">Re-evaluate the clinical signs and measure Hct 3.</td></tr>
<tr><td>Htc stable
Children and adults:
Ringer lactate
3-5 ml/kg/h for 2-4 h
2-3 ml/kg/h or less depending on clinical response</td><td>Hct increased or vital signs unstable
Children and adults:
Ringer lactate
5-10 ml/kg/h for 1-2 h and re-evaluate as above</td></tr>
<tr><td colspan="3">• If no improvement treat as a Group C patient.
• If improvement (disappearance of the danger signs, improvement of the urine output or PO fluid intake or normalisation of the Hct) gradually reduce the rate of IV fluid administration. Duration of IV fluid administration: 24-48 h.</td></tr>
</table>

Table 2 – Group C: dengue with compensated shock
(BP maintained but signs of shock present)

<table>
<tr><td colspan="5">Measure Hct 1 then give Ringer lactate (1st bolus) Children: 10-20 ml/kg in 1 h
Adults: 5-10 ml/kg in 1 h</td></tr>
<tr><td rowspan="3">If improvement
(no signs of shock present)

Reduction of rate:

Children:
Ringer lactate
10 ml/kg/h for 1-2 h
7 ml/kg/h for 2 h
5 ml/kg/h for 4 h
3 ml/kg/h

Adults:
Ringer lactate
5-7 ml/kg/h for 1-2 h
3-5 ml/kg/h for 2-4 h
2-3 ml/kg/h for 2-4 h</td><td colspan="4">If no improvement (signs of shock present): measure Hct 2.</td></tr>
<tr><td colspan="2">Hct 2 increases or stays elevated[a]

Children: plasma substitute
10-20 ml/kg in 1 h (2nd bolus)
10 ml/kg in 1 h
7 ml/kg in 1h
Adults: Ringer lactate or plasma substitute
10-20 ml/kg in 1 h (2nd bolus)</td><td colspan="2">Hct 2 decreases[b]

Look for severe haemorrhage.</td></tr>
<tr><td>If improvement
(no signs of shock present)

Children:
Ringer lactate according to “Reduction of rate in children”

Adults:
Ringer lactate 7-10 ml/kg/h for 1-2 h
Then according to “Reduction of rate in adults”</td><td>If no improvement
(signs of shock present)

Measure Hct 3 and proceed as above from “Measure Hct 2”.</td><td>No severe haemorrhage

Children and adults:
plasma substitute
10-20 ml/kg in 1 h
Evaluate need for transfusion if no improvement.</td><td>Severe haemorrhage

Transfuse
Children and adults:
fresh whole blood
10-20 ml/kg</td></tr>
<tr><td colspan="3">Verify presence of signs of shock, of fluid overload and measure Hct, then reduce the rate as in “Reduction of rate” if signs of shock are absent.</td></tr>
<tr><td colspan="5">• Reduce the rate when the HR and BP normalise. Always check for signs of fluid overload.
• Continue for 24-36 h (less if PO hydration is tolerated). Supplemental boluses of crystalloids or colloids may be necessary in the next 24 h. Do not administer IV fluids for more than 48 h.</td></tr>
</table>

[a] > 50% in men or increased relative to Hct 1 in women and children.
[b] < 40-45% in men, < 35-40% in women and children 1 year and older, < 30-35% in children less than 1 year.

<table>
<tr><th colspan="5">Table 3 – Group C: dengue with decompensated shock
(pulse and blood pressure unrecordable)</th></tr>
<tr><td colspan="5">Measure Hct 1 then Ringer lactate or plasma substitute (if pulse pressure < 10 mmHg or severe hypotension) IV or IO :
Children and adults: 20 ml/kg in 15-30 min (1st bolus)</td></tr>
<tr><td rowspan="4">If improvement
(no signs of shock present)

Children:
plasma substitute
10 ml/kg in 1 h
Adults:
Ringer lactate or plasma substitute
10 ml/kg in 1 h

Reduction of rate:
Ringer lactate
Children:
10 ml/kg in 1 h
7 ml/kg/h for 2 h
5 ml/kg/h for 4 h
3 ml/kg/h
Adults:
5-7 ml/kg/h for 1-2 h
3-5 ml/kg/h for 2-4 h
2-3 ml/kg/h for 2-4 h</td><td colspan="4">If no improvement (signs of shock present)
Compare Hct 1 (obtained before the 1st bolus) to Hct 0[a] (obtained during the febrile phase or before the critical phase).</td></tr>
<tr><td colspan="2">Hct 1 increases or stays elevated relative to Hct 0
Children and adults:
plasma substitute 10-20 ml/kg in 30-60 min (2nd bolus)
Verify the presence of signs of shock or of fluid overload.</td><td colspan="2">Hct 1 decreases[b] relative to Hct 0
Verify the vital signs and look for signs of severe haemorrhage.</td></tr>
<tr><td>If improvement
Children and adults:
plasma substitute
7-10 ml/kg/h
for 1-2 h
Then
Children and adults:
Ringer lactate
as in “Reduction of rate”</td><td colspan="2">If no improvement: measure Hct 2
If Hct 2 < Hct 1: Severe haemorrhage
Transfuse
Children and adults:
fresh whole blood
10-15 ml/kg

If Hct 2 ≥ Hct 1: No severe haemorrhage
Children and adults:
plasma substitute (3rd bolus)
10-20 ml/kg in 30-60 min
7-10 ml/kg/h for 1-2 h</td><td>No severe haemorrhage
Children and adults:
plasma substitute
10-20 ml/kg in
30-60 min (2nd bolus)
Transfuse if no improvement.</td><td>Severe haemorrhage
Transfuse
Children and adults:
fresh whole blood
10-15 ml/kg</td></tr>
<tr><td>If improvement
Children and adults:
Ringer lactate
as in “Reduction of rate”</td><td>If no improvement
Measure Hct 3 and proceed as above from “Measure Hct 2”.</td><td colspan="2">Verify the presence of signs of shock or of fluid overload and measure Hct.</td></tr>
<tr><td colspan="5">Reduce the IV fluid rate when HR and BP normalise; continue for 24-48 h (or less if PO hydration tolerated). Supplemental boluses of crystalloids or colloids may be necessary in the next 24 h. Do not administer IV fluids for more than 48 h.</td></tr>
</table>

[a] If not available, compare to population norms of haematocrit according to age. If these are not know use the following norms as a reference: < 45% in men, < 40% in women and children 1 year or older, < 35% in children less than 1 year.

[b] < 40-45% in men, < 35-40% in women and in children 1 year and older, < 30-35% in children less than 1 year.

Viral haemorrhagic fevers

– Several diseases with different aetiologies and different modes of transmission are grouped under this term as they present with common clinical signs.
– Dengue haemorrhagic fever is a VHF that is described in a specific chapter (see Dengue).

Clinical features

– Common clinical signs:
  • Fever higher than 38.5°C;
  • Haemorrhagic symptoms (purpura, epistaxis, haematemesis, melaena, etc.).
– The clinical signs are often nonspecific; the severity varies depending on the aetiology (see table, page 223).

Laboratory

– A sample of whole blood must be send to a reference laboratory for serological diagnosis, with a clinical description of the patient. The sample may also be sent on filter paper. It is easier to transport, but the small volume of blood only allows a limited number of aetiologies to be tested.
– Protective clothing must be worn while taking or handling the sample (gown, gloves, glasses, mask, etc.).
– The sample must be sent in a triple packaging system for Category A infectious substances.

Management

Suspicion of haemorrhagic fever (isolated case of fever with haemorrhagic symptoms in an endemic area)

– Isolation: isolation room (or failing that, use screens/partitions); restrict visitors (if a carer is strictly necessary, s/he must be protected with gown, gloves, mask).
– Standard precautions:
  Standard precautions must always be respected. The majority of hospital-acquired infections have occurred due to a lack of respect for these precautions:
  • Hand washing;
  • Gloves for patient examination and when touching blood, body fluids, secretions, excretions, mucous membranes, non-intact skin;
  • Gowns to protect skin and prevent soiling of clothing during consultations and activities that are likely to generate splashes or sprays of blood, body fluids, secretions, or excretions;
  • Surgical mask and goggles, or face shield, to protect mucous membranes of the eyes, nose, and mouth during activities that may generate splashes of blood, body fluids, secretions, and excretions;
  • Adequate procedures for the routine cleaning and disinfection of objects and surfaces;
  • Rubber gloves to handle soiled laundry;

- Safe waste management;
- Safe injection practices.

Confirmed cases of Ebola, Marburg, Lassa, Crimean-Congo fevers or epidemics of unknown origin

– Strict isolation in a reserved area separate from other patient areas, with a defined circuit for entrance/exit and changing room at the entrance/exit; dedicated staff and equipment/supplies; use of disposable material if possible.

– Standard precautions (as above)

PLUS

– Droplet precautions AND contact precautions including personal protective equipment (PPE):
  - two pairs of gloves,
  - double gown or coverall suit,
  - surgical cap or hood, mask, protective glasses,
  - impermeable apron,
  - rubber boots.

  The PPE is to be worn systematically prior to entry into isolation area, regardless the tasks to be performed (care, cleaning, distribution of meals, etc.) and to be removed before leaving the isolation area.

– Disinfection of surfaces, objects, clothing and bedding with chlorine solution; safe handling and on site disposal of waste and excreta, etc.

– In the event of a death, do not wash the body. Prompt and safe burial of the dead as quickly as possible, using a body bag.

Confirmed cases of Yellow fever or Rift Valley fever

– Standard precautions.

– Patient under a mosquito net to prevent transmission.

For all patients: report to the Ministry of Health of the country.

Treatment

– Aetiological treatment: ribavirine for Lassa fever and Crimean-Congo fever.

– Symptomatic treatment:
  - Fever: paracetamol (Chapter 1). Acetylsalicylic acid (aspirin) is contra-indicated.
  - Pain: mild (paracetamol), moderate (tramadol), severe (sublingual morphine): see Pain, Chapter 1).
  - Dehydration: oral rehydration salts and/or IV rehydration with Ringer lactate, see WHO protocol (Appendix 2).
  - Seizures (Chapter 1).
  - Vomiting: **ondansetron** PO
    Children 6 months to < 2 years: 2 mg once daily
    Children 2 to < 4 years: 4 mg/day in 2 divided doses
    Children 4 to < 12 years: 8 mg/day in 2 divided doses
    Children ≥ 12 years and adults: 8 to 16 mg/day in 2 divided doses

– For Ebola and Marburg haemorrhagic fevers: invasive procedures must be strictly limited. Health care staff is at risk of contamination when inserting and maintaining IV lines. An IV line must be well secured so that the patient, often confused, cannot pull it out.

Prevention

– Vaccination
  - Yellow fever:
    Mass vaccination campaign during an epidemic
    Children from 6 months and adults: a single dose of 0.5 ml IM (preferred) or deep SC, in the deltoid muscle. For pregnant women, only administer during an epidemic.
    Routine vaccination (EPI)
  - Rift Valley fever: only during an epidemic.
– Vector control programmes for known vectors.
– Infection control measures are essential in all cases.

	Reservoir/ Vector *Geographical distribution*	Isolation of patients	Clinical feataures *(estimated case fatality rate)*
Ebola* **Marburg**	Bats (?) *Africa*	Strict isolation	CS + sudden onset general malaise, vomiting and diarrhoea *(60-80%)*
Lassa*	Rodents *Central and West Africa*	Strict isolation	CS + facial oedema, purulent pharyngitis, proteinuria on reagent strip *(10-25%)*
Junin and Machupo*	Rodents *South America*	Isolation	CS + vomiting, erythema of the face and, depending on the aetiology: • periorbital oedema, cervical adenopathy, pharyngitis *(15-30%)*
Omsk	Ticks *Europe, Asia*	None	• pharyngitis, reddened conjunctivae *(2-5%)*
Crimean Congo*	Livestock/Ticks *Africa, Asia*	Strict isolation	• oedema of the soft palate, generalised petechial rash *(5-20%)*
FHSR (hantavirus)*	Rodents *Asia and Europe*	None	• proteinuria on reagent strip *(< 1%)*
Kyasanur	Small mammals/Ticks *India*	None	CS + headache, muscle pain, prostration *(2-10%)*
Rift Valley*	Livestock/Mosquitoes *Africa*	Mosquito nets	Clinical signs: • isolated fever • SC • encephalitis • retinitis and blindness *(30-50%)*
Yellow fever*	Primates/Mosquitoes *Africa, South America*	Mosquito nets	CS + jaundice, proteinuria on reagent strip, oliguria, headache *(10-30%)*

* VHF with epidemic potential
CS: common syndrome

HIV infection and AIDS

– Acquired immune deficiency syndrome (AIDS) is the most advanced stage of infection with human immunodeficiency virus (HIV).
– Two subtypes of HIV have been identified. HIV-1 is more widespread than HIV-2, the latter mainly being found in West Africa. HIV-2 is less virulent and less transmissible than HIV-1.
– HIV weakens the immune system by causing a deficit in CD4 T lymphocytes.

Evolution of the disease

– *Primary infection or acute retroviral syndrome*: 50 to 70% of newly infected individuals develop during seroconversion (from 15 days to 3 months post exposure), a viral syndrome with fever, malaise, and lymphadenopathy.
– *Asymptomatic HIV infection* (after seroconversion): a period of clinical latency, but not viral latency. The time period for progression from HIV infection to the development of severe immune deficiency in western countries is approximately 10 years. This period appears to be shorter in developing countries.
– *Symptomatic HIV infection*: with progressive destruction of the immune system, common and more severe diseases occur more frequently, and with higher mortality, in seropositive individuals.
– *AIDS*: this stage corresponds to the development of severe opportunistic infections and neoplasms. From a biological point of view, AIDS is defined as a CD4 count < 200 cells/mm^3. Without treatment the disease progresses rapidly towards death.

The World Health Organization (WHO) has proposed a clinical classification of HIV infection in 4 stages of severity for adults and adolescents and for children[a].

Laboratory

Diagnosis of HIV infection

– The diagnosis is made with serological (detection of antibodies against the virus) or virological (especially in infants) testing.
– Testing should always be done *voluntarily with informed consent*.
– All HIV test results must be strictly *confidential* in order to avoid discrimination.
– The individual should have access to services offering pre-test and post-test counselling, treatment and support.
– A diagnosis of HIV infection can be made only after at least 2 different test results (2 different brands) are clearly positive: the positive result of an initial (highly sensitive) test must be confirmed through use of a second (highly specific) test. In areas where HIV prevalence is low confirmation, diagnosis is made with a three different test.

CD4 lymphocyte counts

– CD4 cell depletion is a marker of the progression of immune depression. The level of the CD4 cell count is a predictor of the development of opportunistic infections or neoplasms and can be used to orient their diagnosis, e.g. cerebral toxoplasmosis or cryptococcal meningitis appear when the CD4 count is below 100 cells/mm^3 in adults. If clinical symptoms/signs are present suggesting one of these infections, but the CD4 count is greater than or equal to 200 cells/mm^3, it is unlikely that that particular infection is present.

[a] WHO case definitions of HIV for surveillance and revised clinical staging and immunological classification de HIV-related disease in adults and children. World Health Organization 2007. http://www.who.int/hiv/pub/guidelines/HIVstaging150307.pdf

Opportunistic infections

It is important to screen for serious opportunistic infections in those at risk (e.g. testing for cryptococcal antigen for all adults with a CD4 count < 100 cells/mm^3 regardless of symptoms).

Treatment of HIV infection

Antiretroviral (ARV) treatment

A multi-drug (at least 3) antiretroviral therapy (ART) is the reference treatment. It does not eradicate the virus, but slows the progression of the disease and improves the patient's clinical state by reducing viral replication and consequently increasing the CD4 cell count to levels beyond the threshold of opportunistic infections.

Therapeutic classes

Four major classes ARV are used:

- NRTI (nucleoside/nucleotide reverse transcriptase inhibitors): zidovudine (AZT), lamivudine (3TC), abacavir (ABC), tenofovir (TDF), emtricitabine (FTC).
- NNRTI (non-nucleoside reverse transcriptase inhibitors): efavirenz (EFV), nevirapine (NVP), etravirine (ETR). HIV-2 is naturally resistant to NNRTIs.
- PI (protease inhibitors): atazanavir (ATV), lopinavir (LPV), ritonavir (RTV), darunavir (DRV).
- INI (integrase inhibitors): dolutegravir, raltegravir.

Principles of ARV treatment

- Daily triple therapy must be taken for life to prevent the rapid development of resistance. It is important that the patient understands this and that adherence to treatment is optimal.
- Follow the ART protocols recommended by national HIV program.
- The most widely used and easiest regimens to administer are 2 NRTI + 1 NNRTI: e.g. TDF/3TC/EFV.
- In the event of treatment failure, all 3 drugs should be replaced with a second-line regimen: 2 other NRTIs + 1 PI.

Other possible combinations exist which are less commonly used or more difficult to manage.

Criteria for ARV treatment

As a priority ART should be initiated in all patients with WHO clinical stage 3 or 4 and patients with CD4 < 350 /mm^3. However, those with higher CD4 counts can initiate ART.

Monitoring of ARV treatment

HIV viral load is an essential tool for monitoring the effectiveness of ARV. CD4 count is useful for identifying severely immunosuppressed. Other tests such as blood count, tests for liver (ALAT) and renal function (creatinine clearance) are not essential, but can be useful in detecting adverse effects.

Treatment of opportunistic and other infections

With progressive immunosuppression, HIV-infected patients who are not receiving triple therapy (or patients on ART but with poor adherence) become increasingly susceptible to infections. For conditions of clinical stages 2 and 3, standard treatments are usually effective. Patients may benefit from primary prophylaxis against opportunistic infections (see Primary prophylaxis). Tuberculosis (TB) is the most common serious opportunistic infection. It can be difficult to diagnose in HIV-infected patients however.

Treatment of pain

Treat all patients for associated pain (see Pain, Chapter 1).

Prevention of HIV infection

– *Sexual transmission*

The most reliable method of prevention is the use of male or female condoms.
Male circumcision decreases significantly the risk of HIV transmission.
Early diagnosis and treatment of sexually transmitted infections is essential as they increase the transmission of HIV (see Chapter 9).
ART to HIV positive and adherent partner does protect the negative partner from HIV infection.

– *Occupational transmission* (accidental needle stick injuries or injuries with contaminated objects, contact between a patient's blood and unprotected broken skin or mucous membranes)

Prevention is based on use of universal precautions to avoid contamination with soiled material or potentially infected body fluids.

Post-exposure prophylaxis (PEP): e.g. in the event of rape or occupational accidental exposure to blood, ARV treatment initiated as soon as possible within 72 hours of exposure for a duration of 1 month may reduce the risk of infection.

– *Nosocomial transmission*

Prevention of nosocomial HIV infection is based on the rational use of injections and strict respect for hygiene and sterilization and disinfection procedures for medical material.
For transfusion: strict respect of indications for transfusion and systematic serological screening of the donor's blood are the two indispensable precautions in the prevention of HIV transmission through transfusions.

– *Transmission in injection drug users*

Needle and syringe exchange programs with disposable needles and syringes for users can reduce the risk.

– *Mother-to-child transmission* (MTCT)

The global rate of vertical transmission varies from 20 to 40%. The risk of transmission through breastfeeding is evaluated at approximately 12% and persists for the duration of breastfeeding.

- *In pregnant women*: HIV transmission from mother-to-child may be reduced by ART. The protocol called Option B+ is the internationally preferred protocol. All HIV-infected pregnant women receive lifelong triple-drug therapy, regardless of the CD4 count or clinical stage, both for their own health and to prevent transmission to the child. The most commonly recommended ART is TDF/3TC/EFV or TDF/FTC/EFV. Check national recommendations. In addition, ARVs are administered to the newborn.
  Programs targeting pregnant women also include other preventive measures such as avoiding artificial rupture of the membranes and systematic episiotomy.
- *In breastfeeding women*: exclusive breastfeeding for the first 6 months of life, introduction of complementary (solid) foods at 6 months, gradual cessation of breastfeeding to the age of 12 months.

Prevention of opportunistic infections

In the absence of ARV treatment, all HIV-infected individuals become symptomatic and evolve towards AIDS. However, some opportunistic infections can be prevented.

Primary prophylaxis

For HIV infected patients who have not previously contracted an opportunistic infection, in order to prevent the development of some opportunistic infections.

Infections	Primary prophylaxis
Pneumocystosis Cerebral toxoplasmosis Isosporiasis Various bacterial infections Malaria	**cotrimoxazole** PO Children: 50 mg SMX + 10 mg TMP/kg once daily Adults: 800 mg SMX + 160 mg TMP once daily

Secondary prophylaxis

For patients who develop a specific opportunistic infection, in order to prevent recurrence once treatment for the infection is completed.

Infections	Primary prophylaxis	Comments
Pneumocystosis	**cotrimoxazole** PO Children: 50 mg SMX + 10 mg TMP/kg once daily Adults: 800 mg SMX + 160 mg TMP once daily	Alternative **dapsone** PO Children: 2 mg/kg once daily without exceeding 100 mg/day Adults: 100 mg once daily
Toxoplasmosis		Alternative Adults: **dapsone** PO: 200 mg weekly or 50 mg daily + **pyrimethamine** PO: 75 mg weekly + **folinic acid** PO: 25 to 30 mg weekly
Isosporiasis		–
Penicilliosis Histoplasmosis	**itraconazole** PO Adults: 200 mg once daily	–
Cryptococcal meningitis	**fluconazole** PO Children: 6 mg/kg once daily Adults: 200 mg once daily	–
Oral or oesophageal candidiasis	**fluconazole** PO Children: 3 to 6 mg/kg once daily Adults: 100 to 200 mg once daily	Only for frequent and severe recurrences
Herpes simplex	**aciclovir** PO Children under 2 years: 400 mg/day in 2 divided doses Children over 2 years and adults: 800 mg/day in 2 divided doses	Only for frequent and severe recurrences

Symptoms	Definitions and aetiologies	Diagnosis	Treatment
Diarrhoea with or without blood (also see Chapter 3)	Diarrhoea is defined as at least 3 liquid stools per day. Aetiologies: **Parasitic infections** • *Isospora belli* • *Cryptosporidium* • *Microsporidium* • *Giardia lamblia* • *Entamoeba histolytica* **Bacterial infections** • *Shigella* • *Salmonella enteritis* • *Campylobacter enteritis* **Mycobacterial infections** • *Mycobacterium tuberculosis* (gastrointestinal TB) • *Mycobacterium avium* complex **Helminthiasis** *Strongyloides stercoralis* **Viral infections** Cytomegalovirus (CMV) **Other causes** • Kaposi sarcoma • Lymphoma • Idiopathic (HIV infection) • Antiretrovirals (especially lopinavir and ritonavir)	1. History and clinical examination 2. Microscopic examination of stool for ova and parasites (2 to 3 samples) *Note:* *I. belli, Cryptosporidium, Microsporidium*, MAC and CMV are unlikely if CD4 count > 200 cells.	• Persistent (> 2 weeks) or chronic (> 4 weeks) diarrhoea is often associated with weight loss and dehydration. • Prevention or treatment of dehydration is critical (Appendix 2). • Depending on the results of the stool examinations: give appropriate treatment. • If there is no laboratory support: ***Acute bloody diarrhoea*** • First-line treatment: Children: **azithromycin** PO: 20 mg/kg once daily for 5 days or **ciprofloxacin** PO: 30 mg/kg/day in 2 divided doses for 7 days Adults: **ciprofloxacin** PO: 1 g/day in 2 divided doses for 7 days • If amoebiasis suspected: **tinidazole** or **metronidazole** PO (Amoebiasis, Chapter 3). ***Non-bloody persistent or chronic diarrhea*** Persistent or chronic diarrhoea suggests advanced immunocompromised state. For patients who qualify for ARVs by CD4 count (or unknown CD4 count), ARV initiation is urgent and will usually resolve symptoms in 14 to 28 days. • *Isospora belli*: **cotrimoxazole** PO Children: 80 mg SMX + 16 mg TMP/kg/day in 2 divided doses for 10 days followed by 50 mg SMX + 10 mg TMP/kg/day in 2 divided doses for 3 weeks Adults: 1600 mg SMX + 320 mg TMP/day in 2 divided doses for 7 to 10 days followed by 800 mg SMX + 160 mg TMP/day in 2 divided doses for 3 weeks • *Cryptosporidium*: no specific treatment in HIV-infected patients • *Microsporidium*: **albendazole** PO (limited efficacy) Children: 20 mg/kg/day (max. 800 mg) in 2 divided doses for 7 days Adults: 800 mg/day in 2 divided doses for 2 to 4 weeks • Helminthiasis: **albendazole** PO Children > 6 months but ≤ 10 kg: 200 mg once daily for 3 days Children > 6 months and adults: 400 mg once daily for 3 days • Giardiasis: **tinidazole** or **metronidazole** (Intestinal protozoan infections, Chapter 6). • If no improvement (and no contra-indications such as bloody diarrhoea), symptomatic treatment with **loperamide** PO: Children < 2 years: contra-indicated Children 2 to 5 years: 3 mg/day Children 6 to 8 years: 4 mg/day Children > 8 years: 6 to 8 mg/day Adults: initial dose of 4 mg then 2 mg after each liquid stool (max. 16 mg/day)

Symptoms	Definitions and aetiologies	Diagnosis	Treatment
Diarrhoea with or without blood (continued)			**Nutrition** ++++ Children: continue to breastfeed; increase daily calorie intake: children 6-11 months: add 150 kcal/d children 12-23 months: add 200 kcal/d children 2-5 years: add 250 kcal/d children 6-9 years: add 350 kcal/d children 10-14 years: add 400 kcal/d Eliminate fresh milk, give porridge prepared with rice water or soup or yoghurts. Give 2.5 ml of oil/meal. Any child 0-5 years should receive zinc sulfate (Diarrhoea, page 90, Chapter 3). Adults: increase the calorie and protein intake (at least 2 g protein/kg/day). No food is excluded but avoid raw food, fresh milk and foods high in fibre. Encourage small, frequent meals.
Oral and oesophageal lesions	**Fungal infections** • Oral candidiasis: see Stomatitis, Chapter 3. • Oesophageal candidiasis: pain on swallowing, dysphagia. May result in weight loss. **Viral infections** • Oral hairy leukoplakia (keratosis on the lateral sides of the tongue due to the Epstein-Barr virus) • Oral and oesophageal herpes **Aphthous ulcers**	Clinical examination is enough to make a diagnosis. Consider all severe oral candidiasis (if the pharynx is involved) as oesophageal candidiasis even in the absence of dysphagia.	• Mild oral candidiasis **nystatin** PO Children and adults: 400 000 IU/day in 4 divided doses (1 ml 4 times per day) or **miconazole** oral gel Children 6 months-2 years: 1.25 ml 4 times per day Children over 2 years and adults: 2.5 ml 4 times per day The treatment lasts 7 to 14 days. • Moderate to severe oral candidiasis and oesophageal candidiasis **fluconazole** PO Children: 3 to 6 mg/kg once daily Adults: 50 to 200 mg once daily up to 400 mg/day if necessary The treatment lasts 7 to 14 days for oral candidiasis and 14 to 21 days for oesophageal candidiasis. *Candidiasis is an indication for prophylaxis with cotrimoxazole.* • Oral hairy leukoplakia: no treatment • Oral herpes: Analgesics (paracetamol, ibuprofen) For recurrent or extensive forms affecting the oesophagus, add: **aciclovir** PO Children under 2 years: 200 mg 5 times/day for 7 days Children over 2 years and adults: 400 mg 5 times/day for 7 days *Secondary prophylaxis only for patients with frequent recurrences.*

Symptoms	Definitions and aetiologies	Diagnosis	Treatment
Respiratory problems (also see Chapter 2)	Cough and/or thoracic pain and/or dyspnoea in a symptomatic HIV infected patient. Aetiologies: **Bacterial infections** • *Streptococcus pneumoniae* • *Haemophilus influenzae* • *Staphylococcus aureus* **Mycobacterial infections** *M. tuberculosis,* MAC **Protozoal infections** *Pneumocystis jiroveci* (PCP) **Fungal infections** • *Cryptococcus neoformans* • *Histoplasma capsulatum* • *Coccidioides immitis* • *Aspergillus spp* • *Penicillium marneffei* **Viral infections** CMV **Neoplasms** • Kaposi sarcoma • Non-Hodgkin's lymphoma **Others** • Lymphoid interstitial pneumonia • Pleural effusion (often TB) • Pericardial effusion (often TB) • Pneumothorax (may be due to PCP)	1. History and clinical examination: Blood in the sputum? If fever < 7 days, dyspnoea: unlikely TB. If cough > 21 days, weight loss, thoracic pain > 15 days, no dyspnoea: likely TB. Pulmonary auscultation: bilateral lobar pneumonia? 2. If possible: a) Look for AFB in sputum b) Chest x-ray • PCP: bilateral interstitial infiltrates • TB: miliary shadowing, large heart, pleural effusion, enlarged lymph nodes inside the chest. *Notes* • MAC, PCP, CMV and fungal infections are unlikely in patients with a CD4 count > 200 cells/mm^3. • Staphylococcal pneumonia is often associated with a pyomyositis or an abscess.	• For the diagnosis and treatment of upper respiratory tract infections, particularly pneumonia: see Chapter 2. • If the chest x-ray is consistent with staphylococcal pneumonia: Children: see Staphylococcal pneumonia, Chapter 2. Adults: **ceftriaxone** IM or slow IV 1 g/day once daily + **cloxacillin** IV 8 g/day in 4 divided doses • If the sputum examination is AFB+, treat for TB. • If the sputum examination is negative and the chest x-ray is consistent with PCP: **cotrimoxazole** PO for 21 days Children: 100 mg SMX + 20 mg TMP/kg/day in 2 divided doses Adults: 4800 SMX + 960 TMP/day in 3 divided doses *Note*: the symptoms may become worse during the first phase of treatment, effectiveness can only be evaluated after one week of treatment. Add **prednisolone** PO for patients with severe PCP with hypoxia: Children: start with 2 mg/kg/day then decrease the dose following the adult example Adults: 80 mg/day in 2 divided doses for 5 days, then 40 mg/day for 5 days then 20 mg/day for 10 days *Secondary prophylaxis is recommended.* • Fungal infections (cryptococcosis, penicilliosis, histoplasmosis): Adults: **amphotericin B** IV: 0.7 to 1 mg/kg/day for 2 weeks (cryptococcosis, penicilliosis) or one to 2 weeks (histoplasmosis), then: **fluconazole** PO: 400 mg/day for 8 weeks (cryptococcosis) **itraconazole** PO: 400 mg/day in 2 divided doses for 10 weeks (penicilliosis) **itraconazole** PO: 600 mg/day in 3 divided doses for 3 days then 200 to 400 mg/day for 12 weeks (histoplasmosis) *Secondary prophylaxis is recommended.*

Symptoms	Definitions and aetiologies	Diagnosis	Treatment
Lymphadenopathy	Enlarged lymph nodes in a symptomatic HIV-infected patient Persistent generalised lymphadenopathy (PGL): • 2 or more extra-inguinal sites • lymph nodes > 1.5 cm • enlarged for 3 or more months PGL is usually due to HIV infection. Aetiologies: **HIV infection** **Infections** • TB • Syphilis • Histoplasmosis • Toxoplasmosis • CMV **Neoplasms** • Kaposi sarcoma • Lymphoma	1. Clinical examination: look for a local cause (skin or dental infection etc.); TB or syphilis. 2. Suspected TB: lymph node aspiration, look for AFB, chest x-ray *Note*: in HIV infected patients, TB is often extrapulmonary. 3. Suspected syphilis: serology 4. If all examinations are negative: biopsy is useful to exclude lymphoma, Kaposi's sarcoma and fungal or mycobacterial infections (see notes for patients in stage 1).	• Treat according to the aetiology or empirical treatment with, for example **doxycycline** PO. • TB: see the MSF handbook *Tuberculosis*. • Early syphilis: **benzathine benzylpenicillin** IM Adults: 2.4 MIU as a single dose (1.2 MIU in each buttock) or **azithromycin** PO Adults: 2 g as a single dose *Note*: in patients in stage 1, no further investigation (other than 1, 2 and 3 in this table) or treatment are required.

Symptoms	Definitions and aetiologies	Treatment
Skin lesions (also see Chapter 4)	**Bacterial infections** • Furunculosis • Impetigo and pyoderma • Axillary hidradenitis • Pyomyositis • Syphilis **Viral infections** • Herpes zoster • Herpes simplex • Genital warts • *Molluscum contagiosum* **Fungal infections** Candidiasis, dermatophytoses and deep mycoses (penicilliosis, cryptococcosis, histoplasmosis, etc.) **Neoplasms** Kaposi sarcoma **Other skin infections** • Chronic prurigo or urticaria • Severe seborrhoeic dermatitis • Psoriasis • Scabies • Diffuse cutaneous xerosis **Rash caused by medication** **Bed sores**	**Bacterial infections** • Furunculosis, impetigo, chronic folliculitis: see Bacterial skin infections, Chapter 4. • Suppurative axillary hidradenitis: local treatment + **doxycycline** PO: 200 mg/day in 1 or 2 divided doses for 6 weeks (in adults) • Pyomyositis: antibiotics and surgical drainage, see Pyomyositis, Chapter 10. • Primary and secondary syphilis: see Chapter 9. **Viral infections** • Herpes zoster: see Herpes simplex and herpes zoster, Chapter 4. For necrotic, extensive forms, eruption on the face, ophthalmic zoster, add **aciclovir** within 48 hours of the onset of lesions: Children (IV route): 15 to 30 mg/kg/day in 3 infusions (every 8 hours) for 7 days Adults (oral route): 800 mg 5 times daily for 7 days • Herpes simplex: see Herpes simplex and herpes zoster, Chapter 4. • Genital warts: see Chapter 9. **Fungal infections** • Candidiasis: 2% cream **miconazole**, twice daily • Dermatophytoses: see Superficial fungal infections, Chapter 4. **Treatment of Kaposi sarcoma (KS)** • Start promptly ART. KS tumours with oedema or ulceration or presence of extensive oral or gastrointestinal or pulmonary KS +/- systemic illness: chemotherapy **Other skin infections** • Prurigo, urticaria: see Other skin disorders, Chapter 4. • Seborrhoeic dermatitis: **Whitfield's** ointment or 2% **miconazole** twice daily. For severe inflammation, use a topical corticosteroid in combination with miconazole. • Xerosis: **zinc oxide** ointment or **calamine** lotion • Psoriasis: **corticosteroids** and **zinc oxide** ointment • Scabies: local treatment. For crusted or profuse scabies, add **ivermectin** PO (see Scabies, Chapter 4).

Symptoms	Definitions and aetiologies	Diagnosis	Treatment
Neurological disorders in adults	Aetiologies: **Infections** • TB meningitis • Cryptococcal meningitis • Cerebral toxoplasmosis • Neurosyphilis • CMV encephalitis • HIV encephalopathy • Progressive multifocal leuko-encephalopathy • Cerebral malaria **Neoplasms** Primary CNS lymphoma **Common causes of headache unrelated to HIV infection**: sometimes more frequent in HIV infected patients (sinusitis, problems with accommodation etc.) **Adverse effects of ARVs**	History and clinical examination: • Change in mental state • Focal deficits • Seizures • Signs of meningeal irritation • Raised intercranial pressure • Motor problems, ataxia In settings where cryptococcal infection is common, screen all adults with CD4 < 100 prior to initiation of ART, using a rapid CrAg test on serum or plasma. In endemic areas: check for malaria (if febrile). Lumbar puncture (LP) if not contra-indicated. Elements in favour of neurosyphilis: • VDRL positive in blood and/or CSF • cells in the CSF • high protein in the CSF	Positive malaria test: see Malaria, Chapter 6. For patients with focal signs, treat for toxoplasmosis for 6 weeks: **pyrimethamine** PO: 200 mg in 2 divided doses on the 1st day, then 75 to 100 mg/day + **sulfadiazine** PO: 4 to 6 g/day + **folinic acid** PO: 15 mg/day or, if not available, **cotrimoxazole** PO at high doses: 50 mg SMX + 10 mg TMP/kg/day in 2 divided doses for 4 weeks *A secondary prophylaxis is recommended.* If the LP is positive: • Bacterial meningitis: see Chapter 7. • TB meningitis: see the MSF handbook *Tuberculosis*. • Cryptococcal meningitis (in order of preference): **amphotericin B** IV: 0.7-1 mg/kg/d + **flucytosine** PO: 100 mg/kg/d for 2 weeks then **fluconazole** PO: 400-800 mg/d for 8 weeks or **amphotericin B** IV: 0.7-1 mg/kg/d + **fluconazole** PO: 800 mg/d for 2 weeks then **fluconazole** PO alone: 400-800 mg/d for 8 weeks or **amphotericin B** IV: 0.7-1 mg/kg/d for 5-7 days + **fluconazole** PO: 800 mg/d for 10 weeks or **fluconazole** PO: 1200 mg/d + **flucytosine** PO: 100 mg/kg/d for 2 weeks then **fluconazole** PO alone: 800/d for 8 weeks or **fluconazole** PO: 1200 mg/d for 2 weeks then 800 mg/d for 8 weeks During the induction phase: give fluconazole IV (same doses) if the patient cannot take oral treatment; liposomal amphotericin B (3 mg/kg/d, 2 weeks) may be used instead of conventional amphotericin B in case of renal impairment. *A secondary prophylaxis is recommended.* *Note*: intracranial pressure (ICP) is often raised in cryptococcal meningitis. To lower ICP, repeated 'therapeutic' punctures to drain CSF may be necessary at the beginning of treatment. Neurosyphilis: **benzylpenicillin** IV: 12 to 24 MIU/day in 6 injections at 4 hour intervals for 14 days or **ceftriaxone** IV or IM: 2 g once daily for 10 to 14 days Headache of unknown origin: symptomatic treatment starting with a step 1 analgesic (see Pain, Chapter 1).

Symptoms	Definitions and aetiologies	Diagnosis	Treatment
Neurological disorders in children	Aetiologies: • Bacterial meningitis • TB meningitis • Cryptococcal meningitis • Cerebral toxoplasmosis • CMV meningo-encephalitis • Cerebral malaria	Good history taking as only patients with acute episodes benefit from specific aetiological treatment (seizures, meningeal syndrome, focal signs). In endemic areas, check for malaria (if febrile). Lumbar puncture (LP) if not contra-indicated.	Positive malaria test: see Malaria, Chapter 6. If LP is not possible: • Treat for bacterial meningitis if patient febrile and/or meningeal syndrome (see Chapter 7). • Treat for toxoplasmosis if focal neurological signs are present: **pyrimethamine** PO: 2 mg/kg/day in 2 divided doses for 2 days then 1 mg/kg/day + **sulfadiazine** PO: 80 mg/kg/d in 2 divided doses + **folinic acid** PO: 10 mg once daily for 8 weeks or, if not available, **cotrimoxazole** PO at high doses: 50 mg SMX + 10 mg TMP/kg/day in 2 divided doses for 4 weeks *A secondary prophylaxis is recommended.* If the LP is positive: • Bacterial meningitis: see Chapter 7. • TB meningitis: see the MSF handbook *Tuberculosis*. • Cryptococcal meningitis (in order of preference): **amphotericin B** IV: 0.7-1 mg/kg/d + **flucytosine** PO: 100 mg/kg/d for 2 weeks then **fluconazole** PO: 6-12 mg/kg/d (max. 800 mg/d) for 8 weeks or **amphotericin B** V: 0.7-1 mg/kg/d + **fluconazole** PO: 12 mg/kg/d (max. 800 mg/d) for 2 weeks then **fluconazole** PO alone: 6-12 mg/kg/d for 8 weeks or **amphotericin B** IV: 0.7-1 mg/kg/d for 5-7 days + **fluconazole** PO: 12 mg/kg/d (max. 800 mg/d) for 10 weeks or **fluconazole** PO: 12 mg/kg/d (max. 1200 mg/d) + **flucytosine** PO: 100 mg/kg/d for 2 weeks then **fluconazole** PO alone: 12 mg/kg/d (max. 800 mg/d) for 8 weeks or **fluconazole** PO: 12 mg/kg/d (max. 1200 mg/d) for 2 weeks then 12 mg/kg/d (max. 800 mg/d) for 8 weeks During the induction phase: give fluconazole IV (same doses) if the child cannot take oral treatment; liposomal amphotericin B (3 mg/kg/d, 2 weeks) may be used instead of conventional amphotericin B in case of renal impairment. *A secondary prophylaxis is recommended.*

Symptoms	Definitions and aetiologies	Diagnosis	Treatment
Persistent or recurrent fever	Temperature > 38°C, chronic (lasting more than 5 days) or recurrent (multiple episodes in a period of more than 5 days) Aetiologies: **Infections** • Common childhood diseases • Severe bacterial infections (TB, pneumonia, typhoid fever, septicaemia, meningitis, endocarditis, etc.) • Occult bacterial infections (sinusitis, otitis, urinary tract infections) • Opportunistic infections (TB, mycosis, toxoplasmosis) • Malaria **Neoplasms** Non-Hodgkin's lymphoma **HIV infection** **Fever caused by medication**	1. History and clinical examination: look for a ENT or urinary infection, TB, skin infection, enlarged lymph nodes etc. 2. In endemic areas, check for malaria. 3. Suspected TB: look for AFB. 4. Chest x-ray, CBC, blood cultures, urinalysis, stool culture, serology, lumbar puncture (LP). If the child is under treatment, consider adverse effects of medication.	Positive malaria test: see Malaria, Chapter 6. If testing is not available: in endemic zones, treat malaria. Suspected meningitis: treat according to the results of the LP. If LP is not available, treat for bacterial meningitis, see Chapter 7. Identified or suspected focus of infection: • ENT: see Chapter 2; urinary: see Chapter 9, etc. • TB: see the MSF handbook *Tuberculosis*.

Chapter 9:
Genito-urinary diseases

Uro-nephrologic diseases

- Nephrotic syndrome in children
- Urolithiasis
- Acute cystitis
- Acute pyelonephritis
- Acute prostatitis

Genital infections (GI)

- Urethral discharge
- Abnormal vaginal discharge
- Genital ulcers
- Lower abdominal pain in women
- Upper genital tract infections (UGTI)
- Veneral warts
- Major genital infections (summary)

Metrorrhagia

Nephrotic syndrome in children

– Nephrotic syndrome (NS) is characterized by the presence of oedema, heavy proteinuria, hypoalbuminemia, and hyperlipidaemia.
– Primary or idiopathic NS is the most common cause of NS in children between 1 and 10 years. It usually responds to corticosteroids.
– Secondary NS is associated with infectious diseases (e.g. post-infectious glomerulonephritis, endocarditis, hepatitis B and C, HIV infection, malaria, and schistosomiasis) and may respond to treatment of the underlying cause.
– Children with NS are at increased risk of thromboembolism, severe bacterial infections (in particular, due to *S. pneumoniae*) and malnutrition. Untreated NS may progress to renal failure.

Clinical features

– Typically, the child presents with soft, pitting and painless oedema, which varies in location based on position and activity. Upon awaking, the child has periorbital or facial oedema, which over the day decreases as oedema of the legs increases. As oedema worsens, it may localize to the back or genitals, or become generalized with ascites and pleural effusions.
– This oedema should be differentiated from the oedema of severe acute malnutrition (SAM): in SAM, the child presents with bilateral pitting oedema of the feet and lower legs that does not vary with position. Oedema extends upwards to hands and face in severe cases. It is usually associated with typical skin and hair changes (see Kwashiorkor: Severe acute malnutrition, Chapter 1).
– Once SAM is excluded, the following two criteria must be met to make a clinical diagnosis of primary NS:
  • Presence of heavy proteinuria,
  and
  • Absence of associated infections: see Hepatitis B and C and HIV infection (Chapter 8), Malaria and Schistosomiasis (Chapter 6).

Laboratory

– Urine
  • Measure protein with urinary dipstick on three separate voided urine samples (first voided urine if possible). In NS, proteinuria is equal or greater than +++ or equal or greater than 300 mg/dl or 30 g/l[a]. NS is excluded if heavy proteinuria is not consistently present.
  • In case of macroscopic haematuria, or microscopic haematuria ≥ +, consider glomerulo - nephritis.

[a] Nephrotic range proteinuria in children is defined as urinary protein excretion greater than 50 mg/kg/day. Quantitative measurement of protein excretion is normally based on a timed 24-hour urine collection. However, if this test cannot be performed, urine dipstick measurements can be substituted.

– Blood tests (if available)
  • Serum albumin concentration less than 30 g/l and hyperlipidaemia.
  • Blood urea nitrogen (BUN) and creatinine most often in the normal range.
– Perform all necessary laboratory tests to exclude secondary NS.

Treatment

– Hospitalize the child for initial therapy.
– Corticosteroids (prednisolone or prednisone) are indicated in primary NS.
– Before starting corticosteroid treatment:
  • Treat any concomitant acute infections such as pneumonia, peritonitis, sepsis, pharyngitis, or cellulitis.
  • Exclude active tuberculosis and/or start antituberculous treatment.
– Corticosteroid treatment
  See algorithm page 242. Total length of initial treatment is 2 to 4 months.
– Nutrition, fluid intake, nursing and follow-up
  • No salt-added diet.
  • Do not restrict fluids (risk of thrombosis due to hypercoagulability). If oedema is very severe, fluids may initially be restricted (e.g. 75% of usual intake) while monitoring urine output.
  • Encourage child to walk and play to prevent thromboembolism.
  • Discharge child when stable, follow-up at least monthly, more frequently if indicated, weight and urine dipstick at each visit.
  • Instruct the parent to continue no salt-added diet and to seek medical advice in case of fever, abdominal pain, respiratory distress or signs of thromboembolism.
– Management of infections
  Treat infections as soon as they appear but do not routinely give prophylactic antibiotics.
– Immunization
  • Children under 5 years: check that the child has received all EPI vaccines including *Haemophilus influenzae* type B, conjugated pneumococcal vaccine and (if in an endemic area) meningococcal A conjugate vaccine. If not, administer catch-up vaccines.
  • Children over 5 years: check that the child has received tetanus, measles, pneumococcal conjugate and (if in an endemic area) meningococcal A conjugate vaccine. If not, administer catch-up vaccines.

Management of complications

– Intravascular volume depletion potentially leading to shock, present despite oedematous appearance

  Signs include decreased urine output with any one of the following: capillary refill ≥ 3 seconds, poor skin perfusion/mottling, cold extremities, low blood pressure (if available).

  If signs are present, administer **human albumin 5%** IV: 1 g/kg. If albumin is not available, administer **Ringer Lactate** or **0.9% sodium chloride**: 10 ml/kg over 30 minutes.
  If signs of shock are present, see Shock, Chapter 1.

– Respiratory distress due to severe oedema (rare)

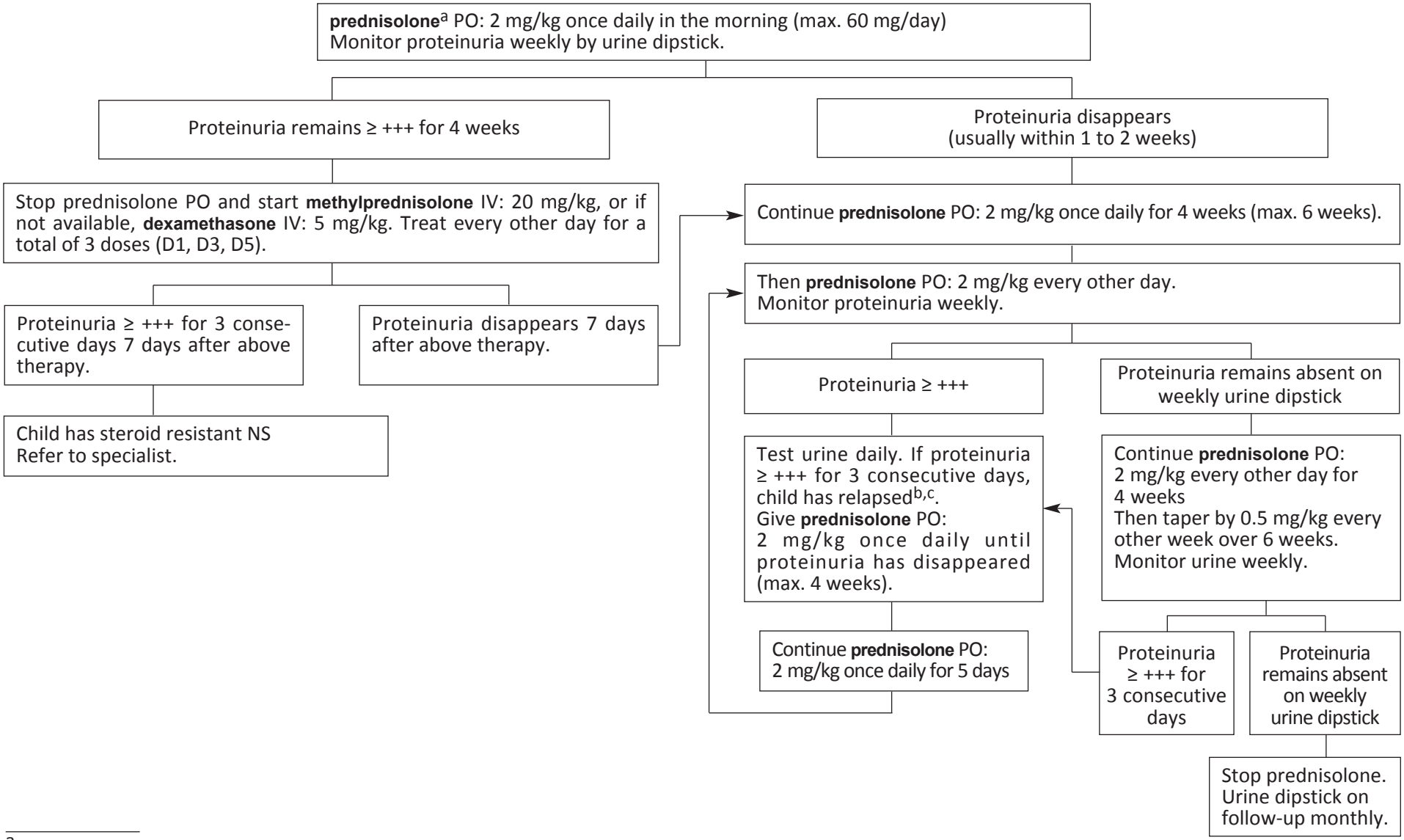
  This is the only situation in which diuretics should be used and only if there are no signs of intravascular volume depletion or after hypovolaemia has been corrected:
  furosemide PO: 1 mg/kg/day in 2 divided doses

  If not effective, discontinue furosemide. If creatinine is normal, administer **spironolactone** PO: 2 mg/kg/day in 2 divided doses. The dose can be increased to 9 mg/kg/day in resistant cases of ascites.

  While on diuretics, monitor for dehydration, thromboembolism and hypokalaemia.

Specialized advice and management (including further investigations such as renal biopsy) are required:
– In children less than 1 year or more than 10 years,
– In case of steroid resistant NS,
– In case of mixed nephrotic and nephritic clinical picture.

In case of steroid-resistant NS, when referral is impossible and as a last resort, the following palliative measure may reduce proteinuria and delay renal failure:
enalapril PO: 0.2 to 0.6 mg/kg/day in 2 divided doses (start with the lowest dose and increase gradually if necessary until reduction of proteinuria). If available, monitor for hyperkalaemia.
However, the prognosis for steroid-resistant NS is poor in the absence of specialized treatment.


prednisolone[a] PO: 2 mg/kg once daily in the morning (max. 60 mg/day)
Monitor proteinuria weekly by urine dipstick.
Proteinuria remains ≥ +++ for 4 weeks
Proteinuria disappears
(usually within 1 to 2 weeks)
Stop prednisolone PO and start **methylprednisolone** IV: 20 mg/kg, or if not available, **dexamethasone** IV: 5 mg/kg. Treat every other day for a total of 3 doses (D1, D3, D5).
Continue **prednisolone** PO: 2 mg/kg once daily for 4 weeks (max. 6 weeks).
Then **prednisolone** PO: 2 mg/kg every other day.
Monitor proteinuria weekly.
Proteinuria ≥ +++ for 3 consecutive days 7 days after above therapy.
Proteinuria disappears 7 days after above therapy.
Child has steroid resistant NS
Refer to specialist.
Proteinuria ≥ +++
Proteinuria remains absent on weekly urine dipstick
Test urine daily. If proteinuria ≥ +++ for 3 consecutive days, child has relapsed[b,c].
Give **prednisolone** PO:
2 mg/kg once daily until proteinuria has disappeared (max. 4 weeks).
Continue **prednisolone** PO:
2 mg/kg every other day for 4 weeks
Then taper by 0.5 mg/kg every other week over 6 weeks.
Monitor urine weekly.
Continue **prednisolone** PO:
2 mg/kg once daily for 5 days
Proteinuria ≥ +++ for 3 consecutive days
Proteinuria remains absent on weekly urine dipstick
Stop prednisolone.
Urine dipstick on follow-up monthly.

a Prednisone is used interchangeably with prednisolone in this algorithm.
b If child has relapsed more than once, treat until proteinuria disappears but then taper prednisolone down to 0.5 mg/kg every other day rather than discontinuing entirely and treat for 12 months. Continue as long as proteinuria remains negative. If proteinuria recurs, treat as relapse. Child has steroid dependent NS.
c Frequent relapses: 2 or more in the first 6 months or 4 or more in a 12 month period.

Urolithiasis

Partial or complete obstruction of the urinary tract by one or more calculi.

Clinical features

– Acute, sometimes intense, flank or pelvic pain (renal colic).
– Haematuria, may be accompanied by the passage of a calculus.
– Urinalysis: haematuria, leucocyturia may be present.
– Secondary infections may develop: cystitis or pyelonephritis.

Treatment

– Increase fluid intake: 3 to 4 litres/day
– Analgesics:
  • For moderate pain
    diclofenac PO: 150 mg/day in 3 divided doses for 3 days
    + **hyoscine butylbromide** PO: 30 to 60 mg/day in 3 divided doses for 3 days
  • For renal colic
    diclofenac IM: 75 mg/injection, 1 or 2 times/day for a maximum of 2 days then change to oral treatment
    + **hyoscine butylbromide** IM: 10 to 20 mg/injection to be repeated every 8 hours according to the clinical evolution
– In patients with infection: antibiotic treatment as for pyelonephritis. The effectiveness will depend on the passage of the calculus.

Acute cystitis

Cystitis is an infection of the bladder and urethra that affects mainly women and girls from 2 years of age. *Escherichia coli* is the causative pathogen in 70 to 95% of cases. Other pathogens include *Proteus mirabilis*, enterococcus, *Klebsiella* spp and in young women, *S. saprophyticus.*

Clinical features

– Burning pain on urination and pollakiuria (passing of small quantities of urine more frequently than normal); in children: crying when passing urine; involuntary loss of urine.

AND

– No fever (or mild fever), no flank pain; no systemic signs and symptoms in children.

It is essential to rule out pyelonephritis.
The symptom 'burning pain on urination' alone is insufficient to make the diagnosis. In the event of abnormal vaginal discharge, see page 253.

Laboratory

– Urine dipstick test:
  Perform dipstick analysis for nitrites (which indicate the presence of enterobacteria) and leukocytes (which indicate an inflammation) in the urine.
  • If dipstick analysis is negative for both nitrites and leukocytes, a urinary infection is excluded.
  • If dipstick analysis is positive for nitrites and/or leukocytes, a urinary infection is likely.
– Microscopy/culture: when a dipstick analysis is positive, it is recommended to carry out urine microscopy/culture in order to confirm the infection and identify the causative pathogen, particularly in children and pregnant women.

When urine microscopy is not feasible, an empirical antibiotic treatment should be administered to patients with typical signs of cystitis and positive dipstick urinalysis (leucocytes and/or nitrites).

Note: aside of these results, in areas where urinary schistosomiasis is endemic, consider schistosomiasis in patients with macroscopic haematuria or microscopic haematuria detected by dipstick test, especially in children from 5 to 15 years, even if the patient may suffer from concomitant bacterial cystitis.

Treatment

Cystitis in girls ≥ 2 years

cefixime PO: 8 mg/kg once daily for 3 days
or
amoxicillin/clavulanic acid PO (dose expressed in amoxicillin) 25 mg/kg/day in 2 divided doses (with formulation 8:1 or 7:1 or 4:1)
Note: the dose of clavulanic acid should not exceed 12.5 mg/kg/day (or 375 mg/day).

Cystitis in non pregnant women

– If dipstick analysis is positive for both nitrites and leukocytes:
fosfomycin-trometamine PO: 3 g as a single dose
or
ciprofloxacin PO: 500 mg/day in 2 divided doses for 3 days
or
nitrofurantoin PO (except in patients with G6PD deficiency): 300 mg/day in 3 divided doses for 5 days

– If dipstick analysis is negative for nitrites but positive for leukocytes, the infection may be due to *S. saprophyticus*. Fosfomycin is not active against this pathogen. Use ciprofloxacin or nitrofurantoin, as above.

– Whatever the antibiotic used, symptoms may persist for 2 to 3 days despite adequate treatment.

– In the event of treatment failure (or recurrent cystitis i.e. > 3-4 episodes/year), **ciprofloxacin** PO: 1 g/day in 2 divided doses for 5 days

– For patients with recurrent cystitis, consider bladder stones, urinary schistosomiasis, urinary tuberculosis or gonorrhoea (examine the partner).

Cystitis in pregnant or lactating women

fosfomycine-tromethamine PO as above
or
céfixime PO: 400 mg/day in 2 divided doses for 5 days
or
nitrofurantoin PO (except in the last month of pregnancy, the first month of breast- feeding and in patients with G6PD deficiency): 300 mg/day in 3 divided doses for 5 to 7 days

Acute pyelonephritis

Pyelonephritis is an acute infection of the renal parenchyma, potentially severe, especially in pregnant women, neonates and infants. The pathogens causing pyelonephritis are the same as those causing cystitis (see Acute cystitis).

Clinical features

Neonates and infants

– Symptoms are not specific: fever, irritability, vomiting, poor oral intake. Palpation of the lower abdomen may show abdominal tenderness. The absence of fever does not rule out the diagnosis. On the other hand, fever –with no obvious cause– may be the only manifestation.
– Neonates may present with fever or hypothermia, altered general condition, altered conscious state, pale/grey colour, shock.

In practice, a urinary tract infection should be suspected in children with unexplained fever or septic syndrome with no obvious focus of infection.

Older children and adults

– Signs of cystitis (burning on urination and pollakiuria, etc.)
AND
– Fever > 38.5°C and flank pain (often unilateral) or abdominal tenderness

Laboratory

See Acute cystitis.

Treatment

– Antibiotic therapy in children
  - *Children under one month*

    cefotaxime slow IV (3 minutes) for 10 days
    Children 0 to 7 days (< 2 kg): 100 mg/kg/day in 2 divided doses
    Children 0 to 7 days (≥ 2 kg): 150 mg/kg/day in 3 divided doses
    Children 8 days to < 1 month: 150 mg/kg/day in 3 divided doses
    or
    ampicillin slow IV (3 minutes) for 10 days
    Children 0 to 7 days (< 2 kg): 100 mg/kg/day in 2 divided doses
    Children 0 to 7 days (≥ 2 kg): 150 mg/kg/day in 3 divided doses
    Children 8 days to < 1 month: 150 mg/kg/day in 3 divided doses
    + **gentamicin** slow IV (3 minutes) or infusion (30 minutes) for 5 days
    Children 0 to 7 days (< 2 kg): 3 mg/kg once daily
    Children 0 to 7 days (≥ 2 kg): 5 mg/kg once daily
    Children 8 days to < 1 month: 5 mg/kg once daily

- *Children over one month*

  ceftriaxone IM or slow IV[a] (3 minutes): 50 mg/kg once daily until the child's condition improves (at least 3 days)

  then change to oral treatment with:
  amoxicillin/clavulanic acid PO (dose expressed in amoxicillin)
  Children < 40 kg: 45 to 50 mg/kg/day in 2 doses (if using ratio 8:1 or 7:1) or in 3 doses (if using ratio 4:1)
  Children ≥ 40 kg: 1500 to 2000 mg/day in 2 doses (if using ratio 8:1 or 7:1) or in 3 doses (if using ratio 4:1)
  The dose of clavulanic acid should not exceed 12.5 mg/kg/day or 375 mg/day.

– Antibiotic therapy in adults

- *Pyelonephritis with no signs of serious illness*

  ciprofloxacin PO: 1 to 1.5 g/day in 2 or 3 divided doses for 7 days
  or
  cefixime PO: 400 mg/day in 2 divided doses for 10 to 14 days

- *Presence of signs of serious illness* (vomiting, patient seen late in disease, sepsis) or *patient is in poor general condition* (e.g. malnutrition, presence of other diseases)

  ceftriaxone IM: 1 g/once daily for at least 3 days, then change to oral treatment with **cefixime** PO: 400 mg/day in 2 divided doses to complete 10 to 14 days of treatment (up to 21 days depending on clinical response)
  + **gentamicin** IM: 6 mg/kg once daily for 3 days (if sepsis)

  or, if not available:
  ampicillin slow IV (3 minutes): 8 g/day in 3 injections for at least 3 days
  + **gentamicin** IM: 6 mg/kg once daily for 3 days
  then change to oral treatment with **amoxicillin** PO: 4 g/day in 2 divided doses to complete 10 to 14 days of treatment

– Treatment of fever and pain: use paracetamol rather than NSAID (Fever, Chapter 1).

– Maintain proper hydration (1.5 litre/day in adults), especially in children (risk of dehydration); treat dehydration if present (Appendix 2).

– Management of septic shock if needed.

[a] The solvent of ceftriaxone for IM injection contains lidocaine. Ceftriaxone reconstituted using this solvent must never be administered by IV route. For IV administration, water for injection must always be used.

Acute prostatitis

Acute infection of the prostate, most commonly due to Gram negative bacteria.

Clinical features

– Signs of cystitis (burning on urination and urinary frequency) with fever in men, perineal pain is common.
– Very painful rectal examination.
– Urinalysis: leucocyturia and pyuria; haematuria may be present.

Treatment

Difficult, the infection may become chronic.

– Increase fluid intake: 3 to 4 litres/day
– Fever and pain (Chapter 1)
– Prolonged antibiotic treatment:
ciprofloxacin PO: 1 g/day in 2 divided doses for 28 days

Genital infections (GI)

The diagnosis and treatment of genital infections present several difficulties: clinical features are not specific; many infections are asymptomatic; laboratory tests available in the field are not always reliable; mixed infections are common; partners need to be treated simultaneously in case of sexually transmitted infections[a] and the risk of recurrence or treatment failure is increased in HIV-infected patients.

Thus, the WHO has introduced the syndromic management of GI and developed standardised case management flowcharts: based on the identification of consistent groups of signs and symptoms (syndromes), patients are treated for the pathogens/ infections[b] that may cause each syndrome.

Look for a genital infection if a patient complains of:	See
Urethral discharge Painful or difficult urination (dysuria)	Urethral discharge
Abnormal vaginal discharge Vulvar itching/burning Pain with intercourse (dyspareunia) Painful or difficult urination (dysuria)	Abnormal vaginal discharge
Genital blisters or sores Burning sensation in the vulva or perineum	Genital ulcers
Skin growths in the genital (or anal) area	Venereal warts
Lower abdominal pain (in women)	Lower abdominal pain Upper genital tract infections

Basic principles of GI management

- The patient can be effectively treated without laboratory testing. Some tests may help in diagnosing vaginal and urethral discharge, but they should never delay treatment (results should be available within one hour).
- The patient should be treated at his/her first encounter with the health care provider (no patient should be sent home without treatment, e.g. while waiting for laboratory results).
- Single dose regimens are preferred when indicated.
- In the case of urethral discharge, abnormal vaginal discharge (except candidiasis), genital ulcers (except herpes) and sexually transmitted upper genital tract infection, the sexual partner should receive a treatment. In the case of candidiasis, genital herpes and venereal warts, the partner is treated only if symptomatic.
- Patients with sexually transmitted infections should receive information on their disease(s) and treatment and be counselled on risk reduction and HIV testing. Condoms should be provided for the duration of treatment.

[a] Genital infections may be sexually transmitted (e.g. gonorrhoea, chlamydia) or not (e.g. most cases of candidiasis).

[b] Keep in mind that in *Schistosoma haematobium* endemic areas, genital symptoms may also be due to, or associated with, genitourinary schistosomiasis (see Schistosomiasis, Chapter 6).

Special situation: sexual violence

Taking into consideration the physical, psychological, legal and social consequences of sexual violence, *medical care* is not limited to the diagnosis and treatment of genital lesions or infections.

Care includes listening to the victim's story, a complete physical examination, laboratory tests if available, and completion of a medical certificate (see Appendix 3).

During the consultation, prophylactic or curative treatments must be proposed to the patient.

– *Prophylactic treatment:*
  - priority is given to:
    a) the risk of HIV transmission. Start antiretroviral therapy as early as possible if the patient is seen within 48-72 hours after exposure (see HIV infection and AIDS, Chapter 8);
    b) the risk of pregnancy resulting from rape. Administer emergency contraception as soon as possible, ideally within 72 hours after the rape: **levonorgestrel** PO, one 1.5 mg tablet single dose[c]; double the dose (3 mg) if the patient is also taking HIV post- exposure prophylaxis or an enzyme-inducing drug (e.g. rifampicin, carbamazepine, some antiretrovirals);
  - prevention of sexually transmitted infections includes a single dose treatment with **azithromycin** PO 2 g + **ceftriaxone** IM 250 mg (or, if ceftriaxone is not available, **cefixime** PO 400 mg). If necessary, treatment of trichomoniasis may be started later than the other treatments (**tinidazole** or **metronidazole** PO, 2 g single dose);
  - tetanus prophylaxis and/or vaccination (see Tetanus, Chapter 7) if there are any wounds;
  - vaccination against hepatitis B (accelerated vaccination schedule, see Viral hepatitis, Chapter 8).

– *Curative treatment:*
  - of wounds,
  - of any related pathologies/infections if the assault is not recent.

Mental health care is necessary irrespective of any delay between the event and the patient arriving for a consultation. Care is based on immediate attention (one-on-one reception and listening) and if necessary, follow-up care with a view to detecting and treating any psychological and/or psychiatric sequelae (anxiety, depression, post- traumatic stress disorder, etc.). See Chapter 11.

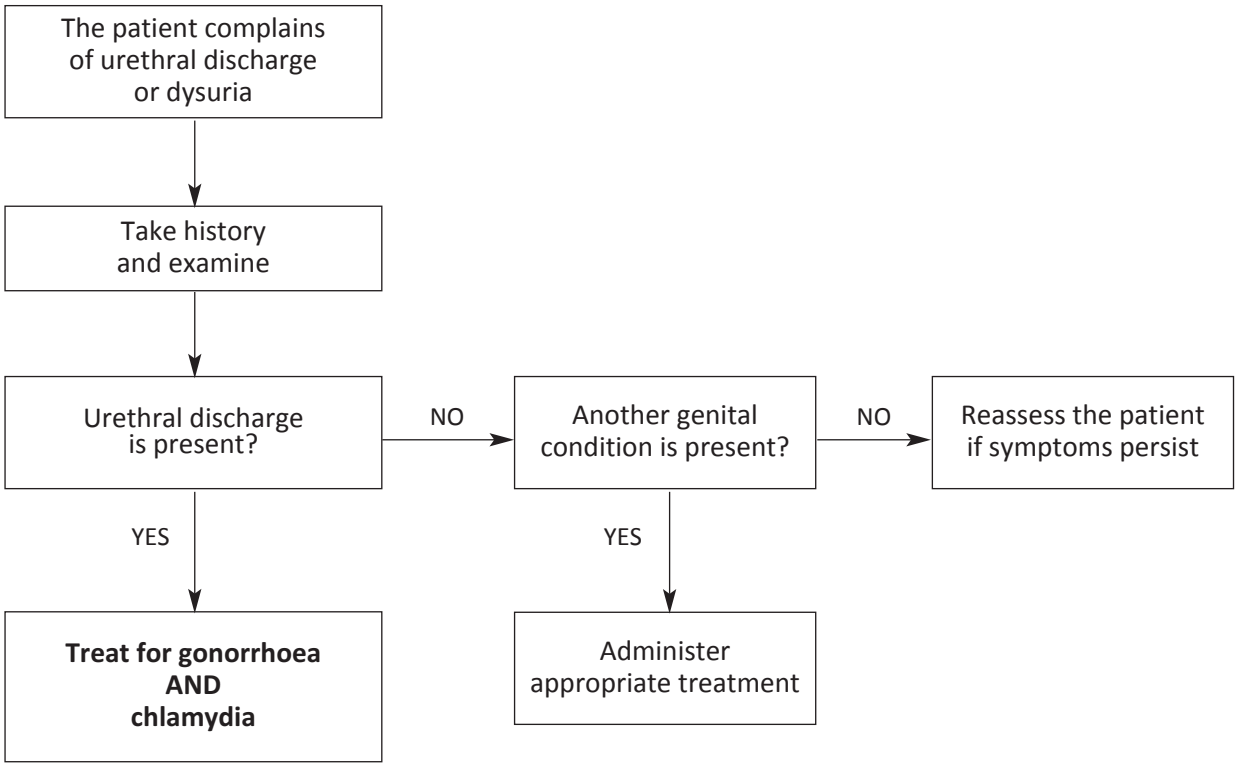
[c] Nevertheless, between 72 and 120 hours (5 days) after the rape, emergency contraception is still sufficiently effective to be administered.

Urethral discharge

Urethral discharge is seen almost exclusively in men. The principal causative organisms are *Neisseria gonorrhoeae* (gonorrhoea) and *Chlamydia trachomatis* (chlamydia).

The presence of abnormal discharge should be confirmed by performing a clinical examination[a]. In males, the urethra should be milked gently if no discharge is visible. Furthermore, specifically check for urethral discharge in patients complaining of painful or difficult urination (dysuria).

Case management



Laboratory

- *C. trachomatis* cannot easily be identified in a field laboratory. In the absence of validated rapid diagnostic tests, the treatment is empiric.
- In men, a methylene blue or Gram stained smear from a urethral swab may be used to detect gonococci (Gram negative intracellular diplococci).

[a] In areas where lymphatic filariasis is endemic, be careful not to confuse purulent urethral discharge with milky or rice-water urine (chyluria) suggestive of lymphatic filariasis.

Treatment of the patient

– In women: same treatment as cervicitis.

– In men:
  • If microscopy of a urethral smear has been performed: in the absence of gonococci, treat for chlamydia alone; in the presence of gonococci, treat for chlamydia AND gonorrhoea.
  • When no laboratory is available, treat for chlamydia AND gonorrhoea as below:

Treatment for chlamydia		Treatment for gonorrhoea
azithromycin PO: 1 g as a single dose our **doxycycline** PO: 200 mg/day in 2 divided doses for 7 days	**PLUS**	**ceftriaxone** IM: 250 mg as a single dose or, if ceftriaxone is not available, **cefixime** PO: 400 mg as a single dose or **spectinomycin** IM: 2 g as a single dose

If urethral discharge persists or reappears after 7 days:
– Verify that the patient has received an effective treatment (i.e. one of the combinations above).
– Gonococcal resistance is a possibility if another treatment (e.g. cotrimoxazole or kanamycin) has been administered: re-treat for gonorrhoea as above (chlamydia is rarely resistant).
– If an effective antibiotic therapy has been given, consider trichomoniasis (**tinidazole** or **metronidazole** PO, 2 g as a single dose); also consider re-infection.

Treatment of the partner

The sexual partner receives the same treatment as the patient, whether or not symptoms are present.

Abnormal vaginal discharge

Abnormal vaginal discharge is defined as discharge that differs from usual with respect to colour/odour/consistency (e.g. discoloured or purulent or malodorous).

Abnormal discharge is often associated with vulvar pruritus or pain with intercourse (dyspareunia), or painful or difficult urination (dysuria) or lower abdominal pain. Routinely check for abnormal vaginal discharge in women presenting with these symptoms.

Abnormal vaginal discharge may be a sign of infection of the vagina (vaginitis) and/or the cervix (cervicitis) or upper genital tract infection.
The presence of abnormal discharge must be confirmed by performing a clinical examination: inspection of the vulva, speculum exam (checking for cervical/vaginal inflammation or discharge).
Abdominal and bimanual pelvic examinations should be performed routinely in all women presenting with vaginal discharge to rule out upper genital tract infection (lower abdominal pain and cervical motion tenderness).

The principal causative organisms are:

- In vaginitis: *Gardnerella vaginalis* and other bacteria (bacterial vaginosis), *Trichomonas vaginalis* (trichomoniasis) and *Candida albicans* (candidiasis).
- In cervicitis: *Neisseria gonorrhoeae* (gonorrhoea) and *Chlamydia trachomatis* (chlamydia).
- In upper genital tract infections: see page 260.

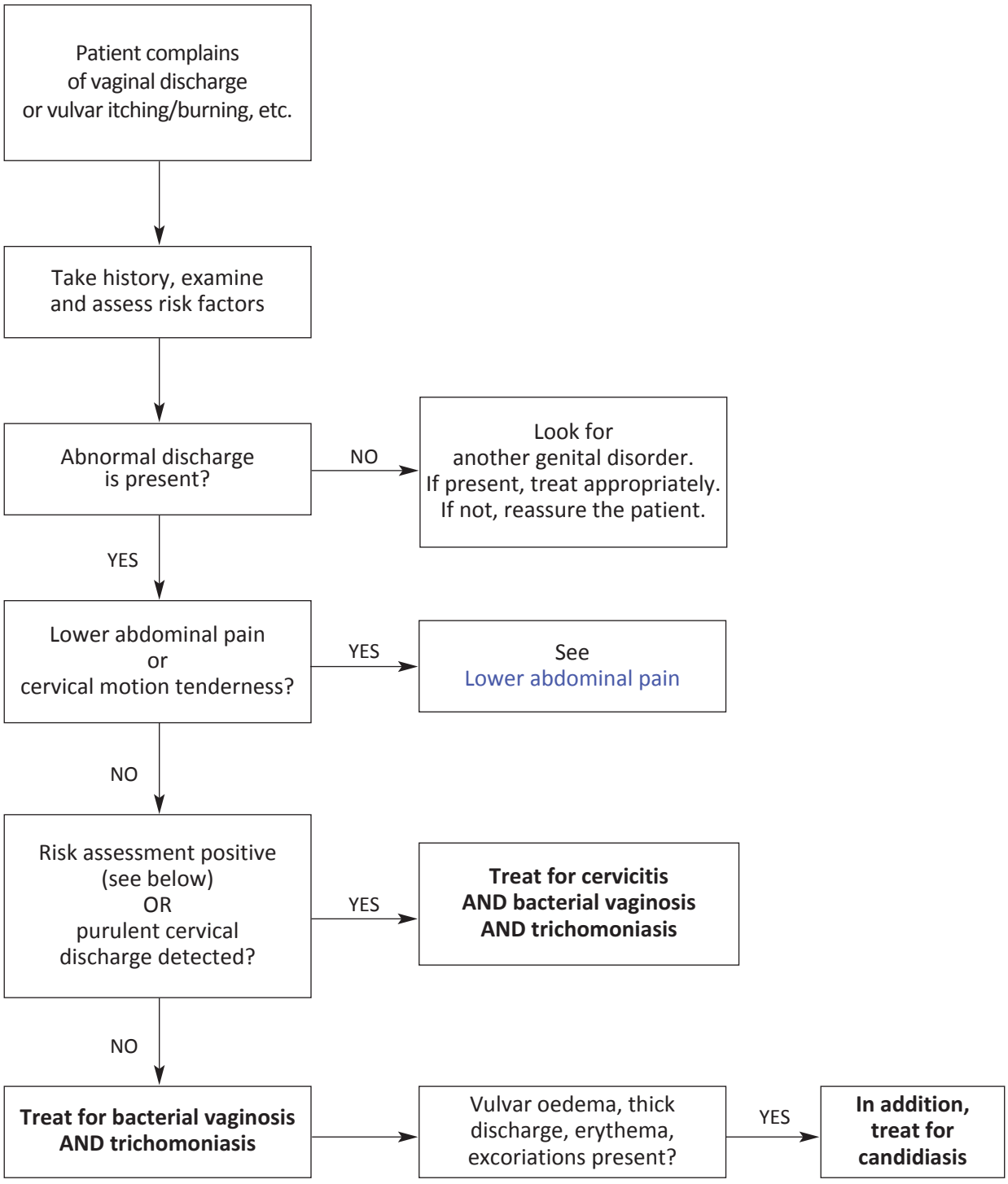
Case management

See algorithm, following page.

Laboratory

- Tests usually available in the field can only identify causes of vaginitis, and thus are of limited usefulness.
  Microscopic examination of a fresh wet smear may show mobile *T. vaginalis*, yeast cells and hyphae in candidiasis, and “clue cells” in bacterial vaginosis.
- Identification of *N. gonorrhoeae* by Gram stained smear is not sensitive in women and is not recommended.

Case management


Patient complains of vaginal discharge or vulvar itching/burning, etc.
Take history, examine and assess risk factors
Abnormal discharge is present?
NO
Look for another genital disorder. If present, treat appropriately. If not, reassure the patient.
YES
Lower abdominal pain or cervical motion tenderness?
YES
See Lower abdominal pain
NO
Risk assessment positive (see below) OR purulent cervical discharge detected?
YES
Treat for cervicitis AND bacterial vaginosis AND trichomoniasis
NO
Treat for bacterial vaginosis AND trichomoniasis
Vulvar oedema, thick discharge, erythema, excoriations present?
YES
In addition, treat for candidiasis

Cervicitis may be difficult to diagnose. When in doubt, administer treatment for cervicitis to women with abnormal vaginal discharge and any of the following risk factors:

– Urethral discharge in the partner
– Context of sexual violence or prostitution
– New partner or more than one partner in the preceding 3 months

Treatment of the patient

Cervicitis

Treat for both chlamydia AND gonorrhoea.

Non-pregnant women		
Treatment for chlamydia		**Treatment for gonorrhoea**
azithromycin PO: 1 g as a single dose or **doxycycline** PO: 200 mg/day in 2 divided doses for 7 days	**PLUS**	**ceftriaxone** IM: 250 mg as a single dose or, if ceftriaxone is not available, **cefixime** PO: 400 mg as a single dose or **spectinomycin** IM: 2 g as a single dose
Pregnant women		
azithromycin PO: 1 g as a single dose or **erythromycin** PO: 2 g/day in 2 or 4 divided doses for 7 days	**PLUS**	**ceftriaxone** IM: 250 mg as a single dose or, if ceftriaxone is not available, **cefixime** PO: 400 mg as a single dose

Bacterial vaginosis and trichomoniasis

tinidazole PO: 2 g as a single dose
or **metronidazole** PO: 2 g as a single dose

In the case of treatment failure:
tinidazole PO: 1 g/day in 2 divided doses for 5 days
or **metronidazole** PO: 800 to 1000 mg/day in 2 divided doses for 7 days

Vulvovaginal candidiasis

clotrimazole (500 mg vaginal tablet): 1 tablet as a single dose, inserted deep into the vagina at bedtime

or, if not available,
clotrimazole (100 mg vaginal tablet): one tablet inserted deep into the vagina at bedtime for 6 days
or **nystatin** (100,000 IU vaginal tablet): one tablet inserted deep into the vagina at bedtime for 14 days

If the patient has extensive vulvar involvement, **miconazole 2%** cream (2 applications to the vulva daily for 7 days) may be used in combination with the intravaginal treatment above. Miconazole cream may complement, but does not replace, treatment with clotrimazole.

Treatment of the partner

When the patient is treated for vaginitis or cervicitis, the sexual partner receives the same treatment as the patient, whether or not symptoms are present.

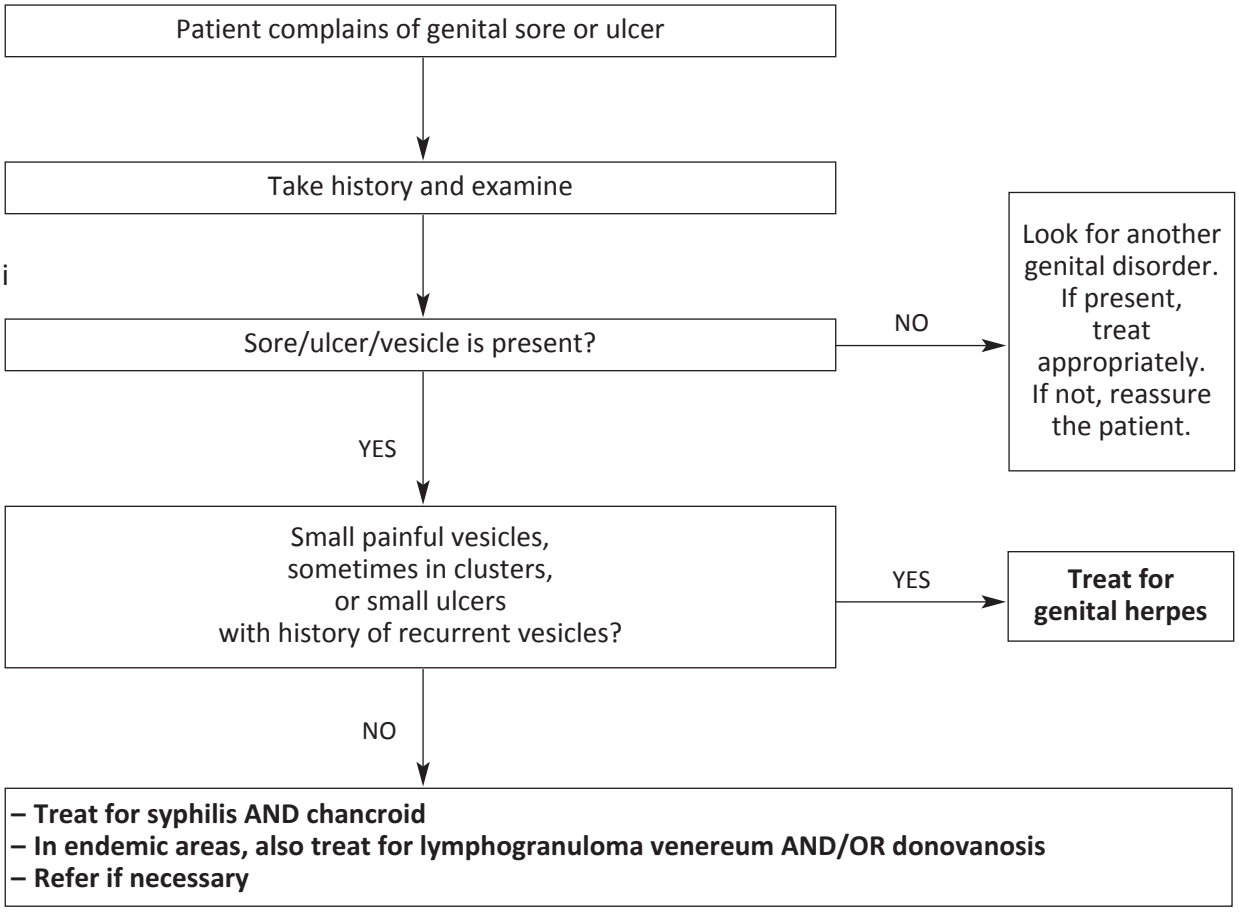
In the case of vulvovaginal candidiasis, the partner is treated only if symptomatic (itching and redness of the glans/prepuce): **miconazole 2%**, 2 applications daily for 7 days.

Genital ulcers

Genital ulcers, defined as single or multiple vesicular, ulcerative or erosive lesions of the genital tract, with or without inguinal lymphadenopathy, should lead to consideration of sexually transmitted infection.

The principal causative organisms are *Treponema pallidum* (syphilis), *Haemophilus ducreyi* (chancroid) and *Herpes simplex* (genital herpes). *Chlamydia trachomatis* (lymphogranuloma venereum) and *Calymmatobacterium granulomatis* (donovanosis)[a] are less frequent.

Case management


Patient complains of genital sore or ulcer
Take history and examine
i
Sore/ulcer/vesicle is present?
NO
Look for another genital disorder. If present, treat appropriately. If not, reassure the patient.
YES
Small painful vesicles, sometimes in clusters, or small ulcers with history of recurrent vesicles?
YES
Treat for genital herpes
NO
– Treat for syphilis AND chancroid
– In endemic areas, also treat for lymphogranuloma venereum AND/OR donovanosis
– Refer if necessary

Laboratory

Laboratory testing available in the field is of little value: e.g., in syphilis, a negative RPR or VDRL result does not exclude primary syphilis in early stage, and a positive test may reflect previous infection in a successfully treated patient.

[a] Lymphogranuloma venereum is endemic in East and West Africa, India, Southeast Asia, South America and the Caribbean. Donovanosis is endemic in South Africa, Papua New Guinea, India, Brazil and the Caribbean.

Treatment of the patient

Genital herpes

– Local treatment: clean the area with soap and water.

– Antiviral treatment: **aciclovir** PO
In patients with a first episode, treatment may reduce the duration of symptom when given within 5 days after the onset of symptoms: 1200 mg/day in 3 divided doses for 7 days
In patients with recurrence, give the same dose for 5 days, but treatment is only effective if initiated during the prodromal phase or within 24 hours after the onset of symptoms.
In patients with frequent recurrences (more than 6 episodes/year), see HIV infection and AIDS, page 227, Chapter 8.

– Treatment of pain: paracetamol PO (Chapter 1).

Syphilis

benzathine benzylpenicillin IM: 2.4 MUI/injection (half the dose in each buttock). Administer a single dose for early syphilis (less than 2 years); one injection per week for 3 weeks for late syphilis (more than 2 years) or if the duration of infection is unknown.

or, for penicillin-allergic patients:
azithromycin PO: 2 g as a single dose
or
erythromycin PO: 2 g/day in 2 or 4 divided doses for 14 days
or
doxycycline PO: 200 mg/day in 2 divided doses for 14 days[b]

Chancroid

azithromycin PO: 1 g as a single dose
or
ceftriaxone IM: 250 mg as a single dose
or
ciprofloxacin PO: 1 g/day in 2 divided doses for 3 days[c]
or
erythromycin PO: 2 g/day in 2 or 4 divided doses for 7 days

Fluctuant lymph nodes may be aspirated through healthy skin as required. Do not incise and drain lymph nodes.

Note: treat simultaneously for syphilis AND chancroid as both are frequent, and cannot be correctly distinguished on clinical grounds.

Lymphogranuloma venereum

erythromycin PO: 2 g/day in 2 or 4 divided doses for 14 days
or
doxycycline PO: 200 mg/day in 2 divided doses for 14 days[b]

Fluctuant lymph nodes may be aspirated through healthy skin as required. Do not incise and drain lymph nodes.

[b] Doxycycline is contra-indicated in pregnant women and breast-feeding women.
[c] Ciprofloxacin should be avoided in pregnant women.

Donovanosis

Treatment is given until the complete disappearance of the lesions (usually, several weeks; otherwise risk of recurrence):
azithromycin PO: 1 g the first day then, 500 mg once daily
or
erythromycin PO: 2 g/day in 2 or 4 divided doses
or
doxycycline PO: 200 mg/day in 2 divided doses[d]

In HIV infected patients, add **gentamicin** IM: 6 mg/kg once daily.

Treatment of the partner

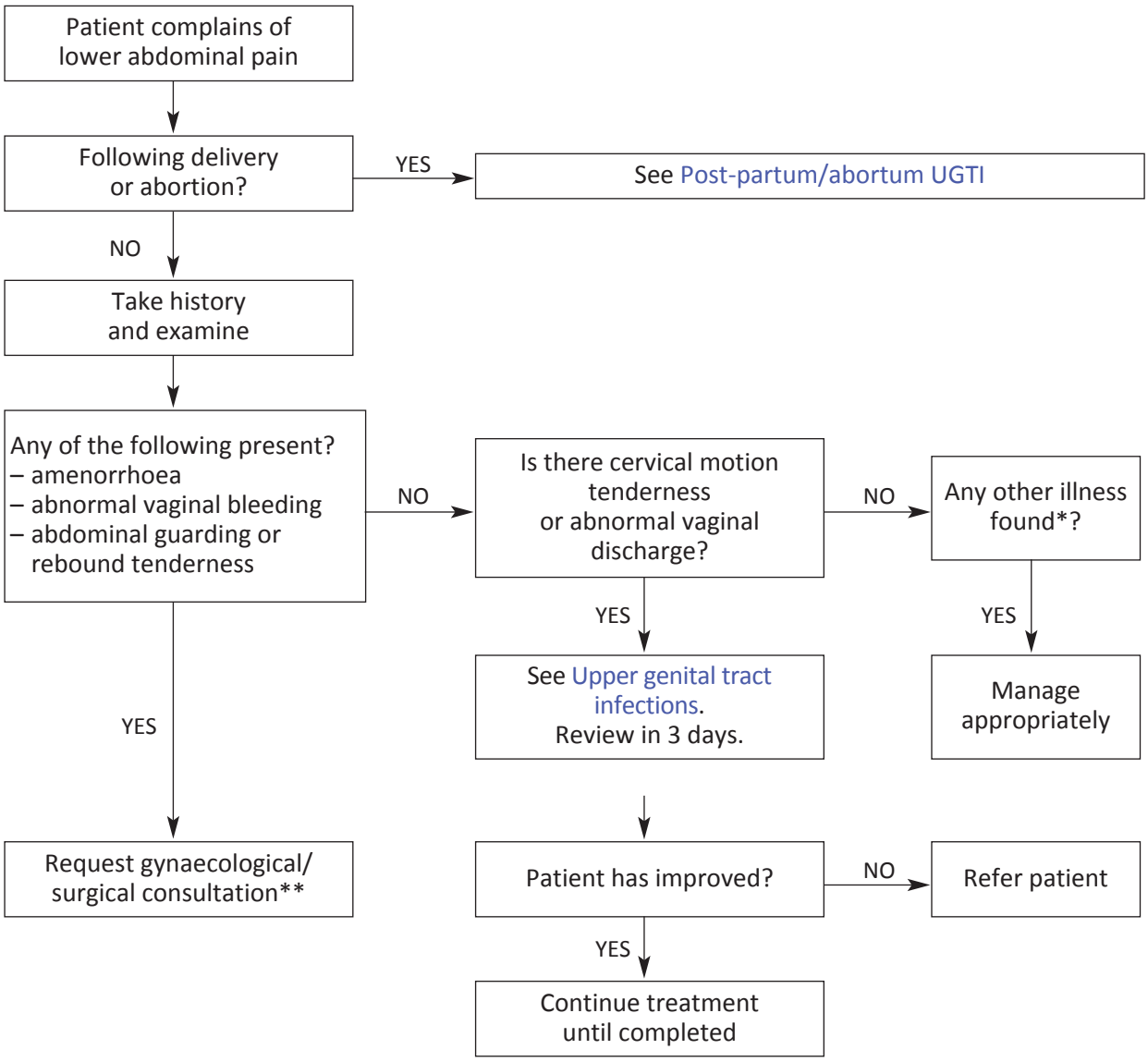
The sexual partner receives the same treatment as the patient, whether or not symptoms are present, except in the case of genital herpes (the partner is treated only if symptomatic).

[d] Doxycycline is contra-indicated in pregnant women and breast-feeding women.

Lower abdominal pain in women

Upper genital tract infection should be suspected in women with lower abdominal pain (see Upper genital tract infections).
Gynaecological examination should be routinely performed:
– Inspection of the vulva, speculum examination: check for purulent discharge or inflammation,
and
– Abdominal exam and bimanual pelvic exam: check for pain on mobilising the cervix.

Case management



* Look for another cause (in particular, gastrointestinal or urinary pathology).
** Look for a pregnancy related pathology (threatened abortion, extra-uterine pregnancy) or a complication (peritonitis, pelvic abscess).

Upper genital tract infections (UGTI)

Upper genital tract infections are bacterial infections of the uterus (endometritis) and/or the fallopian tubes (salpingitis), which may be complicated by peritonitis, pelvic abscess or septicaemia.
UGTI may be sexually transmitted or arise after childbirth or abortion. Antibiotic choices are directed by the most common pathogens in each scenario.
If peritonitis or pelvic abscess is suspected, request a surgical opinion while initiating antibiotic therapy.

Clinical features

Sexually transmitted infections

Diagnosis may be difficult, as clinical presentation is variable.
– Suggestive symptoms are: abdominal pain, abnormal vaginal discharge, fever, dyspareunia, menometrorrhagia, dysuria.
– Infection is probable when one or more of the above symptoms are associated with one or more of the following signs: cervical motion tenderness, adnexal tenderness, tender abdominal mass.

Infections after childbirth or abortion

– Most cases present with a typical clinical picture, developing within 2 to 10 days after delivery (caesarean section or vaginal delivery) or abortion (spontaneous or induced):
  • Fever, generally high
  • Abdominal or pelvic pain
  • Malodorous or purulent lochia
  • Enlarged, soft and/or tender uterus
– Check for retained placenta.
– In the early stages, fever may be absent or moderate and abdominal pain may be mild.

Treatment

– Criteria for hospitalisation include:
  • Clinical suspicion of severe or complicated infection (e.g. peritonitis, abscess, septicaemia)
  • Diagnostic uncertainty (e.g. suspicion of extra-uterine pregnancy, appendicitis)
  • Significant obstacles to ambulatory oral treatment
  • No improvement after 48 hours, or deterioration within 48 hours, of outpatient treatment
– All other patients may be treated on an ambulatory basis. They should be reassessed routinely on the third day of treatment to evaluate clinical improvement (decrease in pain, absence of fever). If it is difficult to organise routine follow-up, advise patients to return to clinic if there is no improvement after 48 hours of treatment, or sooner if their condition is worsening.

Sexually transmitted infections

– Antibiotic therapy combines 3 antibiotics to cover the most frequent causative organisms: gonococci, chlamydiae, and anaerobes.
  • Ambulatory treatment:
    cefixime PO: 400 mg as a single dose or **ceftriaxone** IM: 250 mg as a single dose
    + **doxycycline** PO: 200 mg/day in 2 divided doses for 14 days[a]
    + **metronidazole** PO: 1 g/day in 2 divided doses for 14 days
  • Treatment in hospital:
    ceftriaxone IM: 250 mg/day once daily
    + **doxycycline** PO: 200 mg/day in 2 divided doses for 14 days[a]
    + **metronidazole** PO or IV: 1 g/day in 2 divided doses or infusions for 14 days
    Continue triple therapy for 24 to 48 hours after signs and symptoms have improved (resolution of fever, decrease in pain), then continue doxycycline (or erythromycin) + metronidazole to complete 14 days of treatment.
– If an IUD is in place, it should be removed (offer another method of contraception).
– Analgesic treatment according to pain intensity.
– Treatment of the partner: single dose treatment for both gonorrhoea AND chlamydia (as for Urethral discharge), whether or not symptoms are present.

Infections after childbirth or abortion

– Antibiotic therapy: treatment must cover the most frequent causative organisms: anaerobes, Gram negatives and streptococci.
  • Ambulatory treatment (early stages only):
    amoxicillin/clavulanic acid (**co-amoxiclav**) PO for 7 days
    The dose is expressed in amoxicillin. Depending on the formulation of co- amoxiclav available:
    Ratio 8:1: 3000 mg/day = 2 tablets of 500/62.5 mg 3 times per day
    Ratio 7:1: 2625 mg/day = 1 tablet of 875/125 mg 3 times per day
    The dose of clavulanic acid should not exceed 375 mg/day.
    or
    amoxicillin PO: 3 g/day in 3 divided doses + **metronidazole** PO: 1.5 g/day in 3 divided doses for 7 days
  • Treatment in hospital:
    amoxicillin/clavulanic acid (**co-amoxiclav**) IV (dose expressed in amoxicillin): 3 g/day in 3 injections + **gentamicin** IM: 6 mg/kg once daily
    or
    ampicillin IV: 6 g/day in 3 injections
    + **metronidazole** IV: 1.5 g/day in 3 infusions
    + **gentamicin** IM: 6 mg/kg once daily
    Once the patient's condition has improved and oral treatment can be tolerated, co-amoxiclav or amoxicillin + metronidazole may be given PO (as for ambulatory treatment).
    Stop antibiotic therapy 48 hours after resolution of fever and improvement in pain.
    In penicillin-allergic patients, use **clindamycin** (2700 mg/day in 3 divided doses or injections) + **gentamicin** (6 mg/kg once daily).

[a] In pregnant/breastfeeding women: **erythromycin** PO: 2 g/day in 2 to 4 divided doses for 14 days
Single dose azithromycin is not effective against chlamydia in the treatment of sexually transmitted UGTI.

– In case of placental retention: perform digital curettage or manual vacuum extraction(refer to the MSF handbook *Essential obstetric and newborn care*) 24 hours after initiation of antibiotic therapy.

– Analgesic treatment according to pain intensity.

– If the patient's condition deteriorates or if fever persists after 48-72 hours of treatment, consider the possibility of complication requiring additional treatment (e.g. pelvic abscess drainage), otherwise change the antibiotic to ceftriaxone + doxycycline + metronidazole as in hospital-based treatment of sexually transmitted UGTI.

Veneral warts

Venereal warts are benign tumours of the skin or mucous membranes due to certain papilloma viruses (HPV).

Clinical features

– Venereal warts are soft, raised, painless growths, sometimes clustered (cauliflower- like appearance) or macules (flat warts), which are more difficult to discern. Warts can be external (vulva, penis, scrotum, perineum, anus) and/or internal (vagina, cervix, urethra, rectum; oral cavity in HIV infected patients).
– In women, the presence of external warts is an indication for a speculum examination to exclude vaginal or cervical warts. Speculum exam may reveal a friable, fungating tumour on the cervix, suggestive of cancer associated with papilloma virus[a].

Treatment

Choice of treatment depends on the size and location of the warts. Treatment may be less effective, and relapses more frequent, in HIV infected patients.

External warts < 3 cm and vaginal warts

podophyllotoxin 0.5%[b] solution may be self-applied by the patient, but in the event of vaginal warts, the treatment must be applied by medical staff.
Explain the procedure to the patient: apply the solution to the warts using an applicator or cotton bud, sparing the surrounding healthy skin, allow to air dry. On vaginal warts, the solution should be allowed to dry before the speculum is withdrawn.
Apply the solution twice daily, 3 consecutive days per week, for up to 4 weeks.
Podophyllum preparations are contra-indicated in pregnant[c] or breastfeeding women. They should not be applied on cervical, intra-urethral, rectal, oral or extensive warts. Improper use may result in painful ulceration.

External warts > 3 cm; cervical, intra-urethral, rectal and oral warts; warts in pregnant or breastfeeding women

Surgical excision or cryotherapy or electrocoagulation.

[a] Certain types of HPV may cause cancer. Presence of genital warts in women is an indication to screen for pre-cancerous lesions of the cervix, if feasible in the context (visual inspection with acetic acid, or cervical smear, or other available techniques), and to treat any lesions identified (cryotherapy, conisation, etc., according to diagnosis).

[b] **Podophyllum 10%**, **15%** or **25% resin** is another preparation which is much more caustic, and should be applied only by medical staff. Protect the surrounding skin (vaseline or zinc oxide ointment) before applying the resin. Wash off with soap and water after 1 to 4 hours. Apply once weekly for 4 weeks.

[c] Treatment of warts is not an emergency and may be deferred if alternatives to podophyllum preparations are not available. Genital warts are not an indication for caesarean section: it is uncommon for warts to interfere with delivery, and the risk of mother-to-child transmission is very low.

Major genital infections (summary)

Pathogens/ Infections	Clinical features	Laboratory	Treatment
Neisseria gonorrhoeae (gonorrhoea)	• In women: – vaginal discharge, cervicitis (mucopurulent cervical discharge), dysuria (50% of infections are asymptomatic); – UGTI (salpingitis, endometritis). • In men: purulent urethral discharge and sometimes dysuria (5 to 50% of infections are asymptomatic).	• In women: not valid (not sensitive). • In men: Gram or methylene blue stain: intracellular diplococci and polymorphonuclear leucocytes (more than 4 per field).	**ceftriaxone** IM: 250 mg as a single dose or, if ceftriaxone is not available, **cefixime** PO: 400 mg as a single dose Treat also for chlamydia. In case of UGTI, see page 260.
Chlamydia trachomatis (chlamydia)	• In women: – vaginal discharge, cervicitis, and rarely dysuria (> 50% of infections are asymptomatic); – UGTI (salpingitis, endometritis). • In men: mild urethral discharge and/or dysuria but up to 90% of infections are asymptomatic.	The best method is PCR (not feasible under field conditions).	**azithromycin** PO: 1 g as a single dose or **doxycycline** PO[a]: 200 mg/day for 7 days Treat also for gonococcal infection (except when a Gram stain in males shows no *N. gonorrhoeae*). In case of UGTI, see page 260.
Trichomonas vaginalis (trichomoniasis)	• In women: yellow-green vaginal discharge, sometimes foul smelling, vulvar irritation (10 to 50% of infections are asymptomatic). • In men: most infections are asymptomatic. Can produce balanitis, urethritis with mild discharge and sometimes dysuria.	• Wet mount of fresh vaginal fluid shows motile trichomonas (low sensitivity). • pH of urethral/vaginal fluid > 4.5.	**tinidazole** or **metronidazole** PO: 2 g as a single dose
Bacterial vaginosis (*Gardnerella vaginalis* and other associated bacteria)	Diagnosis is made in the presence of 3 of the following 4 signs: • Homogenous grey-white adherent vaginal discharge • pH of vaginal fluid > 4.5 • Vaginal fluid has an amine (fishy) odour, especially when mixed with 10% KOH • Presence of clue cells in wet mount or Gram stain of vaginal fluid		**tinidazole** or **metronidazole** PO: 2 g as a single dose
Candida albicans (candidiasis)	• Mainly seen in women: pruritus and vulvovaginitis, frequently creamy-white vaginal discharge, some- times dysuria. • In men: balanitis/balanoposthitis (inflammation of the glans/prepuce, erythema, pruritus, white pustules) and rarely urethritis	• Saline of KOH wet mount of fresh vaginal fluid shows budding yeast cells and pseudohyphae. • pH of vaginal fluid: normal	• In women: **clotrimazole** 500 mg: one vaginal tablet as a single dose or **clotrimazole** 100 mg: one vaginal tablet/day for 6 days or **nystatin** 100,000 IU: one vaginal tablet/day for 14 days • In men: **miconazole 2%** cream: 2 applications daily for 7 days

Pathogens/ Infections	Clinical features	Laboratory	Treatment
Herpes simplex virus type 2 (genital herpes)	Many asymptomatic carriers. Multiple vesicles on genitals leading to painful ulcerations. In women, affects vulva, vagina and cervix; in males, penis and sometimes urethra. In primary episodes, fever (30%) and lymphadenopathy (50%). Recurrences in 1/3 of infections with shorter and milder symptoms.	Diagnosis by culture, serology and PCR done exclusively at a reference laboratory.	Analgesics, local disinfection. If available, **aciclovir** PO: • Primary episode: 1200 mg/day for 7 days, given within 5 days after onset of lesions. • Recurrent infections: same dose for 5 days, given within 24 hours after onset of lesions.
Treponema pallidum (syphilis)	Single firm painless genital ulcer, often unnoticed.	RPR/VDRL lack sensitivity and specificity, but may be useful for following treatment effectiveness (decrease in titer) or confirming re- infection (rise in titer). Treponemic tests (TPHA, FTA, rapid tests such as SD Bioline®) are more sensitive and specific.	**benzathine benzylpenicillin** IM: 2.4 MIU/injection, single dose (syphylis < 2 years) or one injection/week for 3 weeks (syphilis > 2 years or unknow duration) or **azithromycin** 2 g as a single dose or **erythromycin** 2 g/day for 14 days or **doxycycline** PO[a]: 200 mg/day for 14 days Treat also for chancroid.
Haemophilus ducreyi (chancroid)	Painful single (or multiple) genital ulcer (soft chancre, bleeds easily when touched). Painful and voluminous inguinal lymphadenitis in 50%. Fistulae develop in 25% of cases.	*H. ducreyi* bacillus is difficult to identify on microscopy or by culture.	**azithromycin** PO: 1 g as a single dose or **ceftriaxone** IM: 250 mg as a single dose or **ciprofloxacin** PO[b]: 1 g/day for 3 days or **erythromycin** PO: 2 g/day for 7 days Treat also for syphillis.
Human papillomavirus (venereal warts)	Soft, raised, painless growths, sometimes clustered (acuminate condyloma) or macules (flat warts). Warts can be external (vulva, penis, scrotum, perineum, anus) and/or internal (vagina, cervix, urethra, rectum; oral cavity in HIV infected patients).	The diagnosis is based on clinical features. It feasible in the context, the presence of genital warts in women in an indication to screen for pre-cancerous lesions of the cervix (visual inspection with acetic acid, or cervical smear, or other available techniques).	• External warts < 3 cm and vaginal warts: **podophyllotoxin 0.5%** • External warts > 3 cm; cervical, intra- urethral, rectal and oral warts; warts in pregnant or breastfeeding women: surgical excision or cryotherapy or electrocoagulation.

[a] Doxycycline is contra-indicated in pregnant women. It should not be administered to breast-feeding women if the treatment exceeds 7 days (use erythromycin).

[b] Ciprofloxacin should be avoided in pregnant women.

Metrorrhagia

Genital bleeding unrelated to the menstrual period. In women of childbearing age, always assess if the bleeding is related to a pregnancy.

In all events

– Rapidly assess the severity of bleeding.
– In the event of heavy haemorrhage or shock or if a surgical intervention (laparotomy, caesarean delivery) is required:
  • Start an IV infusion of Ringer lactate; monitor vital signs (pulse, BP);
  • Prepare for a possible blood transfusion (determine patient's group, identify potential donors);
  • If a transfusion is performed, only use blood that has been screened (HIV, hepatitis B and C, syphilis; malaria in endemic zone).
– In the event of referral to a surgical facility, difficult transport conditions might aggravate the haemorrhage: the patient should be infused and accompanied by family members who are potential blood donors.
– Ultrasound is not imperative but it facilitates certain diagnoses (e.g. ectopic pregnancy, placenta praevia).
– Prevent or treat anaemia (measure haemoglobin if possible).

Bleeding unrelated to pregnancy

– Clinical examination:
  • speculum examination: determine the origin of the bleeding [vagina, cervix, uterine cavity]; appearance of the cervix; estimation of blood loss;
  • bimanual pelvic examination: look for uterine motion tenderness, increased volume or abnormalities of the uterus.
– Friable, hard, ulcerated, hypertrophic mass on the cervix: possible cervical cancer; surgical treatment is required. While waiting for surgery, **tranexamic acid** PO (3 g/day in 3 divided doses for 3 to 5 days) may be used to reduce bleeding.
– Inflammation of the cervix, light or moderate bleeding, purulent cervical discharge, pelvic pain: consider cervicitis (see Abnormal vaginal discharge) or salpingitis (see Upper genital tract infections).
– Enlarged, misshapen uterus: uterine fibroids; surgical treatment if large fibroids cause significant bleeding. While waiting for surgery or if surgery is not indicated, treat as a functional uterine bleeding.
– Normal uterus and cervix: possible functional uterine bleeding: **tranexamic acid** PO as above. In situations of repeated bleeding, it can be combined with an NSAID (**ibuprofen** PO: 1200 to 2400 mg/day maximum, in 3 divided doses for 3 to 5 days) and/or a long-term treatment with oral estroprogestogens or injectable progestogens.

  Note: rule out other causes of vaginal bleeding before diagnosing functional uterine bleeding. Consider for example poorly tolerated contraceptive, endometrial cancer in postmenopausal women, genitourinary schistosomiasis in endemic areas (see Schistosomiasis, Chapter 6).

Bleeding during the first half of pregnancy

The two diagnoses to firstly consider are ectopic pregnancy and abortion.

Ectopic pregnancy

Pregnancy that develops outside the uterus, very often in a fallopian tube. Ectopic pregnancy should be suspected in any woman of reproductive age with pelvic pain and/or metrorrhagia. There are many possible clinical presentations and these can mislead diagnosis towards appendicitis, intestinal obstruction, salpingitis or abortion. The major risk of ectopic pregnancy is rupture, leading to intra abdominal haemorrhage.

Clinical features and diagnosis

- Amenorrhoea (may be absent) or menstrual irregularity.
- Dark slight bleeding or light to heavy bright red bleeding; or haemorrhagic shock with light bleeding not corresponding to the severity of shock (intra-abdominal haemorrhage).
- Pelvic pain; sometimes distended abdomen, rebound tenderness.
- On pelvic examination: tender adnexal mass; exquisite pain in the Pouch of Douglas (haemoperitoneum); closed cervix.
- The diagnosis of pregnancy is confirmed by a positive rapid pregnancy test but a negative urinary test does not rule out an ectopic pregnancy.
- If ultrasound is available, the presence of an intra-uterine pregnancy eliminates the diagnosis of an ectopic pregnancy. If ultrasound shows an empty uterus together with intra peritoneal effusion, an ectopic pregnancy is likely, especially if the pregnancy test is positive.

Management

If in doubt (negative urinary pregnancy test, no sign of rupture and stable haemodynamic conditions), hospitalise the patient for surveillance, if possible in a surgical facility. Otherwise, refer immediately for emergency laparotomy.

Threatened abortion

Clinical features

In a context of amenorrhoea: slight, bright red bleeding; pelvic pain; closed cervix.

Management

- Look for foreign bodies or vaginal wound consistent with induced abortion; remove foreign bodies, clean the wound; update tetanus immunization (see Tetanus, Chapter 7).
- Treat pain: paracetamol or antispasmodics PO.
- Place the patient on rest.

Abortion

Clinical features

Slight or significant bright red bleeding; expulsion of the embryo, membranes or products; uterine contractions; open cervix.

Management

- Look for foreign bodies or vaginal wound consistent with induced abortion; remove foreign bodies, clean the wound; update tetanus immunization (see Tetanus, Chapter 7).

– Treat pain: paracetamol or antispasmodics PO.
– Depending on the stage of pregnancy:

  Before 10 weeks of pregnancy: abortion is likely to be complete. Monitor, only intervene in the event of heavy bleeding (aspiration).

  Between 10 and 12/14 weeks of pregnancy[a]: uterine evacuation is often necessary.
  - Instrumental method: manual vacuum aspiration is the method of choice (easier to perform, less traumatic and less painful than curettage).
  - Medical method: the use of **misoprostol** as a single dose (400 micrograms sublingually or 600 micrograms PO) may avoid instrumental procedure. There is, however, a risk of failure that increases as the pregnancy progresses. Treatment success (that is, an empty uterus) must be verified in the days after the drug is taken. If the medical method fails, the use of an instrumental method is unavoidable.

  After 12/14 weeks of pregnancy: labour should be allowed to progress, do not rupture the membranes. The placenta is usually evacuated with the foetus. If evacuation is incomplete or in the event of haemorrhage, perform manual removal immediately after the expulsion, before the uterus retracts or the cervix closes. If manual removal is delayed, curettage must be performed which carries a high risk of uterine perforation.
– In the event of post-abortion infection (pelvic pain, uterine tenderness, foul-smelling vaginal discharge): antibiotic treatment, see Upper genital tract infections.

Bleeding during the second half of pregnancy

Three conditions –placenta praevia, abruptio placentae, and uterine rupture–can quickly become life-threatening to both mother and child. These conditions must be referred to surgical facilities.

When no cause for the bleeding is found, consider the possibility of premature labour.

Placenta praevia

Placenta that covers either entirely or partially the internal os of the cervix. Placenta praevia may give rise to bleeding during the third trimester and carries a high risk of haemorrhage during delivery.

Clinical features and diagnosis

– Sudden, painless, slight or significant bright red bleeding.
– The vaginal exam must be done with extreme care to avoid triggering massive bleeding: uterus is soft; the exam may reveal displacement of the cervix and deformation of the lower uterine segment by the placenta praevia; if the cervix is dilated, the placenta can be felt in the cervix. Do not repeat the examination.
– If ultrasound is available, vaginal examination can be avoided.

Management

– If labour has not yet started and bleeding is light: bed rest and monitoring.
– If labour has started and/or bleeding is heavy: refer to surgical facility.

[a] The gestational age is based on the date of last menstrual period and uterine size. Uterine evacuation, using aspiration or misoprostol are usually recommended up to 12 weeks. However, the estimation of gestational age is often approximative. Thus, these methods can be used up to an estimated gestational age of 12 to 14 weeks.

Abruptio placenta

Haematoma that forms between the placenta and the uterine wall as a result of separation of the placenta, prior to foetal expulsion.

Clinical features

– Dark slight bleeding, sometimes absent, or shock not always consistent with the external blood loss as bleeding is internal.
– Sudden, severe, continuous abdominal pain.
– Tightly contracted uterus; often, foetal heart sounds absent (foetal death).
– Often occurs in a context of pre-eclampsia.

Management

Refer to surgical facility.

Uterine rupture

Tear in the uterine wall, in most cases during labour, often related to inappropriate use of oxytocin.

Clinical features

– Impending rupture: prolonged labour, agitation, alteration of the general state, poor uterine relaxation, continuous abdominal pain, more severe than the contractions.
– Rupture: disappearance of uterine contractions, shock; sometimes, palpation of the dead foetus expelled into the maternal abdomen.

Management

Refer to surgical facility for emergency laparotomy.

Premature labour

Clinical features

Cervical changes (effacement and dilatation) and regular uterine contractions before 37 weeks LMP. Metrorrhagia are not always present in premature labour. If present, blood loss is usually minimal.

Management

– Strict bed rest.
– Allow labour to progress in the following cases: gestation is more than 37 weeks; the cervix is more than 3-4 cm dilated; there is significant bleeding; the foetus is distressed or dead; there is amnionitis or pre-eclampsia.
– Otherwise, tocolysis:
  As first-line treatment, **nifedipine** PO (short-acting capsule): 10 mg by oral route, to be repeated every 15 minutes if uterine contractions persist (maximum 4 doses or 40 mg), then 20 mg every 6 hours for 48 hours.
  Do not administer by sublingual route (risk of placental hypoperfusion, fœtal deatht), always by oral route.

  or, if not available,
  salbutamol IV infusion for 48 hours maximum: dilute 5 mg (10 ampoules of 0.5 mg) in 500 ml of 5% glucose or 0.9% sodium chloride to obtain a solution of 10 micrograms/ml.
  Start infusion at the rate of 15 to 20 micrograms/minute (30 to 40 drops/minute).

If contractions persist, increase the rate by 10 to 20 drops/minute every 30 minutes until uterine contractions cease. Do not exceed 45 micrograms/minute (90 drops/minute).
Continue for one hour after contractions have ceased, then reduce the rate by half every 6 hours.
Monitor maternal pulse regularly, decrease the infusion rate in the event of maternal tachycardia (> 120/minute).

Do not combine nifedipine and salbutamol.

Either tocolysis is effective and contractions cease or diminish: in both cases, do not prolong treatment over 48 hours. Bed rest until the end of pregnancy.
Or tocolysis is not effective, contractions persist and labour begins: take necessary steps for a premature birth.

Post-partum haemorrhage

Haemorrhage, exceeding the usual 500 ml of a normal placental delivery that occurs in the first 24 hours (usually immediately) following the delivery of the child. Post- partum haemorrhage is mainly due to placental retention and uterine atonia, but may also result from uterine rupture or cervical or vaginal lacerations.

Management

- If systolic BP is < 90 mmHg, elevate the legs (keep or replace the patient's feet in the delivery table stirrups).
- SUnder general anaesthesia and antibiotic prophylaxis (**ampicillin** or **cefazolin** IV, 2 g as a single dose): manual removal of the placenta (if not yet delivered) and systematic manual exploration of the uterus to remove any clots/placental debris and to make sure the uterus has not ruptured.
- **oxytocin**: 5 to 10 IU by slow IV injection, and at the same time, start an IV infusion with 20 IU of oxytocin in 1 litre of Ringer lactate or 0.9% sodium chloride, to be administered over 2 hours (160 drops/minute).
- Check for injury to the cervix or vagina using retractors (or speculum).
- Massage of the uterus to expel any clots and aid uterine retraction.
- Insert a urinary catheter to facilitate uterine retraction.
- Continue monitoring (pulse, BP, blood loss). Bleeding should diminish and the uterus should remain firm.

For more information on the management of pregnancy-related bleeding, refer to the MSF handbook, *Essential obstetric and newborn care*.

Chapter 10:
Medical and minor surgical procedures

Dressings

Treatment of a simple wound

Burns

Abscesses

Pyomyositis

Leg ulcers

Necrotising infections of the skin and soft tissues

Venomous bites and stings

Dental infections

Dressings

– The objective of dressing wounds is to promote healing. The procedure includes cleaning, disinfection and protection of the wound while respecting the rules of hygiene.
– Not all wounds need to be covered by a dressing (e.g. a clean wound that has been sutured for several days; a small dry wound not requiring sutures).

Material

– *Sterile instruments*
  • one Kocher or Pean forceps
  • one dissecting forceps
  • one pair of surgical scissors or one scalpel to excise necrotic tissue and to cut gauze or sutures

  Instruments for one dressing for one patient must be wrapped together in paper or fabric (or can be placed in a metallic box) and sterilised together to limit handling and breaks in asepsis. 5 to 10 compresses may be included in this set.
  If there are no sterile instruments, a dressing can be done using sterile gloves.
– *Renewable supplies*
  • sterile compresses
  • non-sterile disposable gloves
  • adhesive tape and/or crepe or gauze bandage
  • sterile 0.9% sodium chloride or sterile water
  • depending on the wound: antiseptic (polyvidone iodine scrub solution, polyvidone iodine dermal solution), paraffin compresses, analgesics

Organisation of care

Proper organization of care helps maintain the rules of asepsis and decreases the risk of contamination of the wound or transmission of organisms from one patient to another:

– Assign one room for dressings. It must be cleaned and the waste removed every day. The dressing table must be disinfected after each patient.
– Dressings may be applied at the bedside if the patient's condition requires. Use a clean, disinfected dressing trolley with: on the upper tray, sterile and/or clean material (dressing set, extra compresses, etc.) and on the lower tray, septic material (container for contaminated instruments, sharps disposal container and a container or garbage bag for waste).
– Prepare all the necessary material in a well lit area. If necessary, arrange for an assistant to be present.
– Wear protective glasses if there is a risk of projection from an oozing wound.
– Always proceed from clean to dirty: start with patients with uninfected wounds. If there are multiple dressings for one patient, start with the cleanest wound.

Technique

– If the procedure may be painful, give an analgesic and wait the necessary time for the drug to take effect before starting the procedure.
– Settle the patient comfortably in an area where his privacy is respected throughout the procedure.
– Explain the procedure to the patient and obtain his co-operation.
– Instruments (or sterile gloves) must be changed between patients.
– To prevent drug interactions, use the same antiseptic for all care of one patient.

Removal of an old dressing

– Wash hands (ordinary soap) or disinfect them with an alcohol-based hand rub.
– Put on non-sterile gloves and remove the adhesive tape, bandage and superficial compresses.
– Proceed gently with the last compresses. If they stick to the wound, loosen them with 0.9% sodium chloride or sterile water before removal.
– Observe the soiled compresses. If there is significant discharge, a greenish colour or a foul odour, a wound infection is likely.
– Discard the dressing and the non-sterile gloves in the waste container.

Observe the wound

– In the case of an open wound, loss of cutaneous tissue or ulcer, the colour is an indicator of the stage in the healing process:
  • *black* area = necrosis, wet or dry infected eschar
  • *yellow* or *greenish* area = infected tissue and presence of pus
  • *red* area = granulation, usually a sign of healing (unless there is hypertrophy), however, red edges indicate inflammation or infection
  • *pink* area = process of epithelisation, the final stage of healing that begins at the edges of the wound
– In the case of a sutured wound, the existence of local signs of suppuration and pain requires the removal of one or more sutures to avoid the infection spreading. Local signs include:
  • red, indurated and painful edges
  • drainage of pus between the sutures, either spontaneously or when pressure is applied on either side of the wound
  • lymphangitis
  • sub-cutaneous crepitations around the wound

In any case, if local signs of infection are observed, look for general signs of infection (fever, chills, changes in the overall condition).

Technique for cleaning and dressing of the wound

– Wash hands again or disinfect them with an alcohol-based hand rub.
– Open the dressing set or box after checking the date of sterilisation and that the wrapping is intact.
– Pick up one of the sterile forceps being careful not to touch anything else.

– Pick up the second forceps with the help of the first one.
– Make a swab by folding a compress in 4 using the forceps.
– *Clean sutured wound or clean open wound with red granulation:*
  • clean with 0.9% sodium chloride or sterile water to remove any organic residue; work from the cleanest to the dirtiest area (use a clean swab for each stroke);
  • dab dry with a sterile compress;
  • re-cover a sutured wound with sterile compresses or an open wound with paraffin compresses; the dressing should extend a few cm beyond the edges of the wound;
  • keep the dressing in place with adhesive tape or a bandage.
– *Necrotic or infected open wounds:*
  • clean with polyvidone iodine (7.5% scrub solution, 1 part of solution + 4 parts of sterile 0.9% sodium chloride or sterile water). Rinse thoroughly then dab dry with a sterile compress; or if not available, sterile 0.9% sodium chloride or sterile water and apply an antiseptic (10% polyvidone iodine dermal solution).
  • apply sterile vaseline and remove all necrotic tissue at each dressing change until the wound is clean.
– Discard any sharp materials used in an appropriate sharps container and the rest of the waste in a waste container.
– As quickly as possible, soak the instruments in disinfectant.
– Wash hands again or disinfect them with an alcohol-based hand rub.

The principles remain the same if the dressing is done using instruments or sterile gloves.

Subsequent dressings

– Clean, sutured wound: remove the initial dressing after 5 days if the wound remains painless and odourless, and if the dressing remains clean. The decision to re-cover or to leave the wound uncovered (if it is dry) often depends on the context and local practices.
– Infected, sutured wound: remove one or more sutures and evacuate the pus. Change the dressing at least once daily.
– Open, dirty wound: daily cleaning and dressing change.
– Open granulating wound: change the dressing every 2 to 3 days, except if the granulation is hypertrophic (in this case, apply local corticosteroids).

Treatment of a simple wound

– A simple wound is a break in the continuity of the skin limited in depth at the sub- cutaneous fatty tissue, that does not affect the underlying structures (muscle, bone, joints, major arteries, nerves, tendons) and without significant loss of tissue.
– The goal of treatment is to assure rapid healing of the wound without complications or sequelae. Several basic rules apply:
  • rapidly treat wounds, while maintaining the rules of asepsis and the order of the initial procedures: cleaning-exploration-excision;
  • identify wounds that need to be sutured and those for which suturing would be harmful or dangerous;
  • immediately suture recent, clean, simple wounds (less than 6 hours old) and delay suturing contaminated wounds and/or those more than 6 hours old;
  • prevent local (abscess) or general (gas gangrene; tetanus) infections.

Material

Instruments (Figures 1a to 1d)

– One dissecting forceps, one needle-holder, one pair of surgical scissors and one Pean or Kocher forceps are usually enough.
– One or two other artery forceps, a pair of Farabeuf retractors and a scalpel may be useful for a contused or deep wound.

Instruments to suture one wound for one patient must be packaged and sterilised together (suture box or set) to limit handling and breaks in asepsis.

Renewable supplies

– For local anaesthesia: sterile syringe and needle; 1% lidocaine (without epinephrine)
– Sterile gloves, fenestrated sterile towel
– Sterile absorbable and non-absorbable sutures
– Antiseptic and supplies for dressings
– For drainage: corrugated rubber drain or equivalent, nylon suture

Technique

– Settle the patient comfortably in an area with good lighting and ensure all the necessary material is prepared.
– Explain the procedure to the patient and ensure his co-operation.
– If the patient is a young child, arrange to have an assistant hold the child if necessary.

Initial cleaning

– Wear suitable clothing: sterile gloves for all wounds and a gown and protective glasses if there is a risk of projection from a bleeding wound.
– Start by washing the wound, prolong the cleaning if the wound is particularly soiled. Use ordinary soap or **polyvidone iodine scrub solution** and water and rinse.
– If necessary use a sterile brush. Cleaning with running water is preferable to cleaning by immersion.
– If the wound is infected and the patient has general signs of infection (fever, chills, changes in the overall condition) systemic antibiotic therapy may be required. Administer antibiotics at least one hour prior to starting care.

Exploration

– Wash hands and put on sterile gloves.
– Disinfect the wound and surrounding area with **10% polyvidone iodine**.
– Cover the wound with a fenestrated sterile towel.
– Local anaesthetic: infiltrate **1% lidocaine** into the edges of the wound and wait at least 2 minutes for the anaesthetic to take effect.
– Proceed carefully from the superficial to the deepest parts of the wound to explore the extent of the wound, if necessary, aided by an assistant.
– Consider the anatomical location of the wound and look for injury to any underlying structures (the clinical examination of a limb must include evaluation of sensitivity and motor functioning, as well as that of tendons in order to orient surgical exploration):
  • a wound that communicates with a fracture is an open fracture,
  • a wound close to a joint may be a joint wound,
  • a wound on the hands or feet may affect the nerves and/or tendons.
– Look for and remove any foreign bodies.
– In the event of significant pain or bleeding, the exploration must be completed in an operating room.

Wound excision

– The goal of the excision is to remove non-viable tissue, which favours the proliferation of bacteria and infection.
– The wound may require little or no excision if it is clean. The excision is more extensive if the wound is bruised, irregular or extensive.
– Limit excision of the skin around the wound, particularly in facial wounds.
– Sub-cutaneous fat and tissue of doubtful viability should be generously excised in order to leave only well vascularised tissue.

Immediate suturing of a simple wound

– Immediate suturing may have serious consequences for the patient if precautions to prevent infection and promote healing are not taken.
– The decision to suture immediately can only be taken after the cleaning, exploration and satisfactory excision, and if the following conditions are met: simple wound, no more than 6 hours old with no devitalised or contused tissue (the wound may be as long as 24 hours old if on the face, scalp, upper limbs or hands).
– Bites (for local treatment see Rabies, Chapter 8) and bullet, shell or mine shrapnel wounds should not be immediately sutured.

Delayed suturing of a simple wound

– Wounds that do not fill the above conditions should not be immediately sutured.
– After cleaning, exploration and excision a simple dressing is applied to the open wound.
– Further cleaning and removal of any remaining necrotic tissue is completed with daily dressing changes.
– If after 72 hours there are no signs of local infection, the wound may be sutured.

Healing by second intention of infected wounds

If the wound does not meet the conditions of cleanliness described above, the wound cannot be sutured. It will heal either spontaneously (healing by secondary intention), or will require a skin graft (once the wound is clean) if there is significant loss of tissue.



Figure 1a
Kocher forceps,
straight, toothed



Figure 1b
Kelly forceps,
curved, non-toothed



Figure 1c
Small artery forceps,
curved, non-toothed

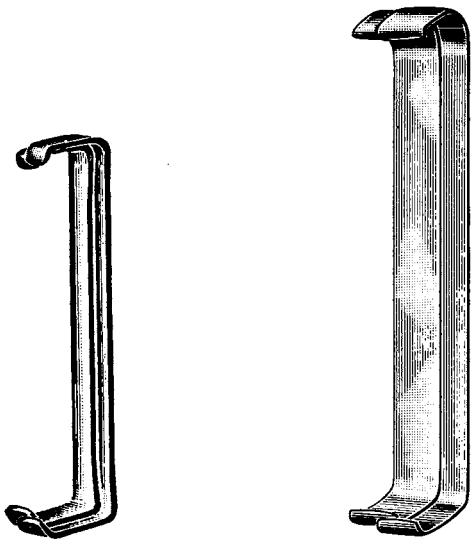


Figure 1d
Farabeuf retractors

Figures 1
Basic instruments

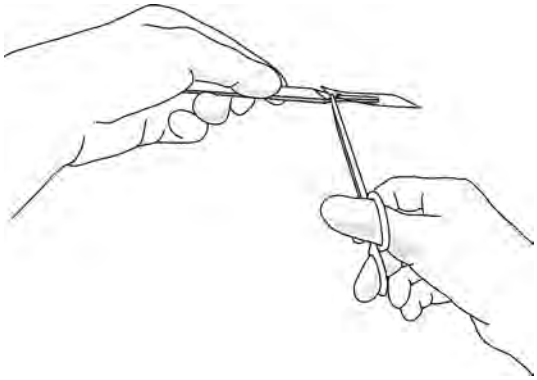


Figure 2a
Always mount a surgical blade using a needle holder.
Change the blade for each new procedure.

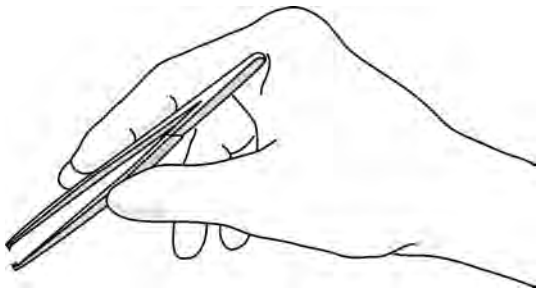


Figure 2b
Dissecting forceps should not be held in the palm of the hand, but rather between the thumb and index finger. Toothed dissecting forceps should only be used on skin.

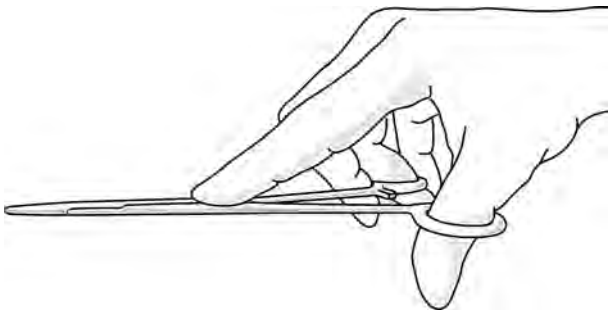


Figure 2c
Insert the thumb and the ring finger into the handle of a needle holder (or scissors), and stabilize the instrument using the index finger.

Figures 2
How to hold instruments

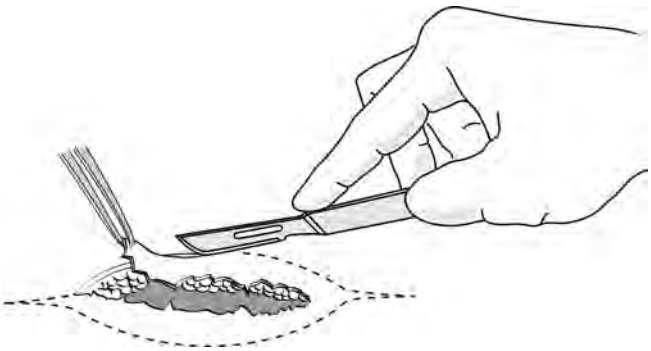


Figure 3a
Debridement of a contused, ragged wound: straightening of the wound edges with a scalpel. Be conservative in facial wounds.

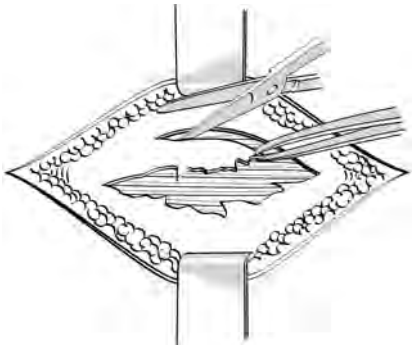


Figure 3b
Excision of edges of the aponeurosis to prevent necrosis.

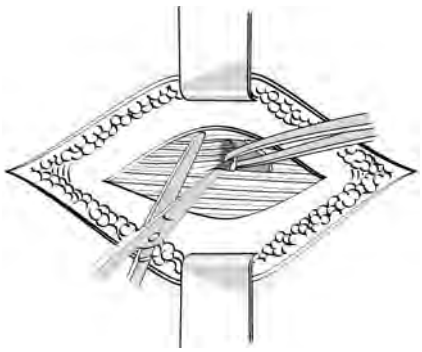


Figure 3c
Excision of contused muscle.

Figures 3
Wound debridement
This should be done sparingly, limited to excision of severely contused or lacerated tissue that is clearly becoming necrotic.

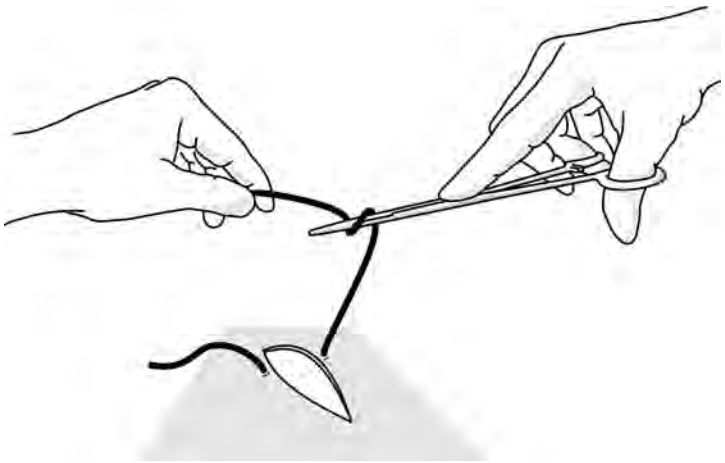


Figure 4a
Loop the suture around the needle holder in one direction and remember the direction of the loop. Grasp the loose end with the needle holder and pull it through the loop to make the first knot. Lower the knot so that it closes the wound.

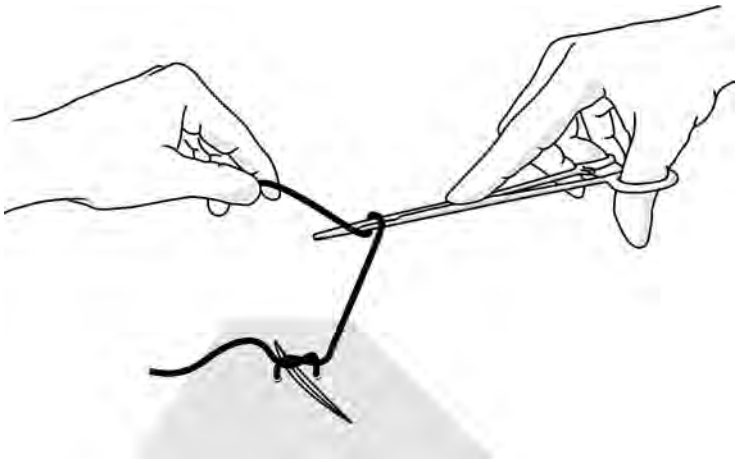


Figure 4b
The second loop should be in the opposite direction.
At least 3 knots are needed to make a suture, alternating from one direction to the other.



Figure 4c
In principle the first knot lies flat.



Figure 4d
Second knot in the opposite direction.

Figures 4
Practising making knots using forceps

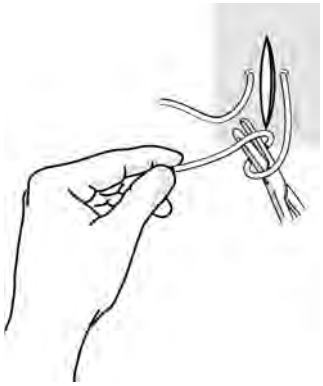


Figure 4e

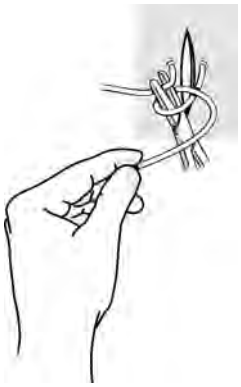


Figure 4f

Grasp the loose end with the needle holder.

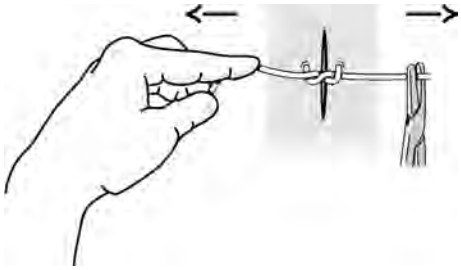


Figure 4g

First flat knot.

Slide the knot towards the wound using the hand holding the loose end while holding the other end with the needle holder. Tighten the knot without causing tissue ischaemia.

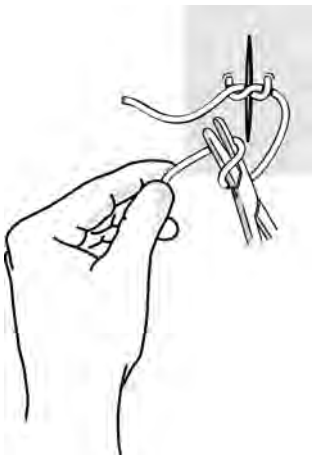


Figure 4h

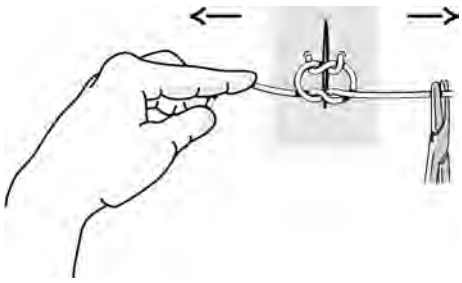


Figure 4i

Second knot in the opposite direction.

Figures 4

Practising making knots using forceps (continued)

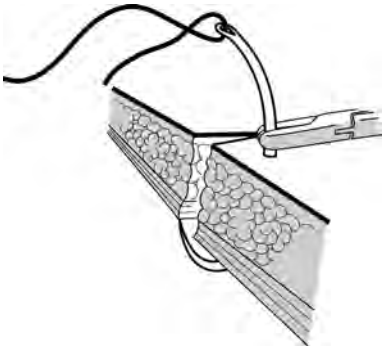


Figure 5a

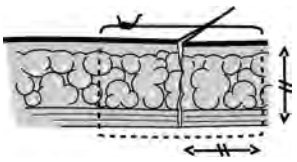


Figure 5b

The suture should be as deep as it is wide.

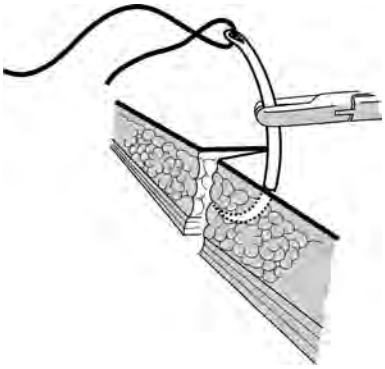


Figure 5c

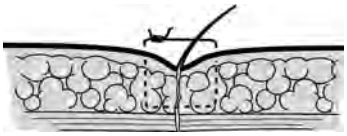


Figure 5d

The suture is too shallow, the edges are invaginated.

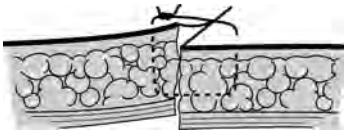


Figure 5e

Poor lining of the edges.

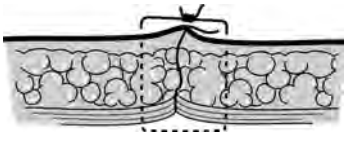


Figure 5f

Do not make the knot directly over the wound.

Figures 5

Particular problems



Figure 6
Closing a corner



Figure 7
Closure of the skin, simple interrupted sutures with non-absorbable sutures

Burns

Burns are cutaneous lesions caused by exposure to heat, electricity, chemicals or radiation. They cause significant pain and may threaten survival and/or compromise function.

Classification of burns

Severe burns: one or more of the following parameters:
– Involving more than 10% of the body surface area (BSA) in children and 15% in adults
– Inhalation injury (smoke, hot air, particles, toxic gas, etc.)
– Major concomitant trauma (fracture, head injury, etc.)
– Location: face, hands, neck, genitalia/perineum, joints (risk of functional deficit)
– Electrical and chemical burns or burns due to explosions
– Age < 3 years or > 60 years or significant co-morbidities (e.g. epilepsy, malnutrition)

Minor burns: involving less than 10% of the BSA in children and 15% in adults, in the absence of other risk factors

Evaluation of burns

Extent of burns

Lund-Browder table – Percentage of body surface area according to age

Location	< 1 year	1-4 years	5-9 years	10-15 years	Adults
Head	19	17	13	10	7
Neck	2	2	2	2	2
Anterior trunk	13	13	13	13	13
Posterior trunk	13	13	13	13	13
Right buttock	2.5	2.5	2.5	2.5	2.5
Left buttock	2.5	2.5	2.5	2.5	2.5
Perineum/genitalia	1	1	1	1	1
Right upper arm	4	4	4	4	4
Left upper arm	4	4	4	4	4
Right lower arm	3	3	3	3	3
Left lower arm	3	3	3	3	3
Right hand	2.5	2.5	2.5	2.5	2.5
Left hand	2.5	2.5	2.5	2.5	2.5
Right thigh	5.5	6.5	8.5	8.5	9.5
Left thigh	5.5	6.5	8.5	8.5	9.5
Right leg	5	5	5.5	6	7
Left leg	5	5	5.5	6	7
Right foot	3.5	3.5	3.5	3.5	3.5
Left foot	3.5	3.5	3.5	3.5	3.5

This table helps to accurately calculate the % of BSA involved according to patient's age: e.g. burn of the face, anterior trunk, inner surface of the lower arm and circumferential burn of left upper arm in a child 2 years of age: 8.5 + 13 + 1.5 + 4 = 27% BSA.

Depth of burns

Apart from first-degree burns (painful erythema of the skin and absence of blisters) and very deep burns (third-degree burns, carbonization), it is not possible, upon initial examination, to determine the depth of burns. Differentiation is possible after D8-D10.

	Superficial burn on D8-D10	Deep burn on D8-D10
Sensation	Normal or pain	Insensitive or diminished sensation
Colour	Pink, blanches with pressure	White, red, brown or black Does not blanch with pressure
Texture	Smooth and supple	Firm and leathery
Appearance	Minimal fibrinous exudate Granulation tissue evident Bleeds when incised	Covered with fibrinous exudate Little or no bleeding when incised
Healing	Heals spontaneously within 5-15 days	• Very deep burn: always requires surgery (no spontaneous healing) • Intermediate burn: may heal spontaneously in 3 to 5 weeks; high risk of infection and permanent sequelae

Evaluation for the presence of inhalation injury

Dyspnoea with chest wall indrawing, bronchospasm, soot in the nares or mouth, productive cough, carbonaceous sputum, hoarseness, etc.

Treatment of severe burns

(in hospital)

I. Initial management

On admission

– Ensure airway is patent; high-flow oxygen, even when SaO_2 is normal.
– Establish intravenous access, through unburned skin if possible (intraosseous access if venous access is not possible).
– **Ringer lactate** (RL): 20 ml/kg during the first hour, even if the patient is stable.
– **Morphine** SC: 0.2 mg/kg (Step 1 and Step 2 analgesics are not effective).
– In the event of chemical burns: flush with copious amounts of water for 15 to 30 min, avoiding contamination of healthy skin; do not attempt to neutralize the chemical agent.

Once the patient is stabilized

– Remove clothes if they are not adherent to the burn.
– Take history of the burn injury: mechanism, causative agent, time, etc.

– Assess the burn injury: extent, depth, carbonization; ocular burns, burns at risk of secondary functional deficits; circumferential burns of the extremities, chest or neck. Wear face mask and sterile gloves during the examination.
– Assess for associated injuries (fractures, etc.).
– Protect the patient and keep him warm: clean/sterile sheet, survival blanket.
– Insert a urinary catheter if burns involve > 15% of BSA, and in the case of electrical burns or burns of the perineum/genitalia.
– Insert a nasogastric tube if burns involve > 20% of BSA (in the operating room while carrying out dressing procedure).
– Calculate and initiate fluid and electrolyte requirements for the first 24 hours.
– Intensive monitoring: level of consciousness, pulse, blood pressure, pulse oxymetry, respiratory rate (RR) hourly; temperature and urine output every 4 hours.
– Additional testing: haemoglobin, blood group, urine dipstick test.
– Prepare the patient for the first dressing procedure in the operating room.

Notes:

– Burns do not bleed in the initial stage: check for haemorrhage if haemoglobin level is normal or low.
– Burns alone do not alter the level of consciousness. In the case if altered consciousness, consider head injury, intoxication, postictal state in epileptic patients.
– Clinical manifestations of electrical burns vary significantly according to the type of current. Look for complications (arrhythmia, rhabdomyolysis, neurological disorders).

II. General measures during the first 48 hours

Resuscitative measures

Intravenous replacement fluid to correct hypovolaemia:

Fluid and electrolyte requirements during the first 48 hours according to age

	Children < 12 years	Children ≥ 12 years and adults
0 - 8 h	2 ml/kg x % BSA of RL + maintenance fluid* per hour x 8 h	2 ml/kg x % BSA of RL
8 - 24 h	2 ml/kg x % BSA of RL + maintenance fluid* per hour x 16 h	2 ml/kg x % BSA of RL
24 - 48 h	Daily maintenance IV fluid requirements* minus oral fluids such as milk, broth, gavage feeds (do not include drinking water in the calculation).	40 ml/kg RL minus oral fluids (do not include drinking water in the calculation).

* maintenance fluid: alternate RL and 5% glucose: 4 ml/kg/h for first 10 kg of body weight + 2 ml/kg/h for next 10 kg + 1 ml/kg/h for each additional kg (over 20 kg, up to 30 kg)

Note: increase replacement volumes by 50% (3 ml/kg x % BSA for the first 8 hours) in the event of inhalation injury or electrical burn. For burns > 50% BSA, limit the calculation to 50% BSA.

This formula provides a guide only and should be adjusted according to systolic arterial pressure (SAP) and urine output. Avoid fluid overload. Reduce replacement fluid volumes if urine output exceeds the upper limit.

Target endpoints for IV replacement fluids

	Non-electrical burns			Electrical burns
	Children < 1 year	Children 1-12 years	Children > 12 years /adults	All ages
AP (mmHg)	SAP ≥ 60	SAP 70 to 90 + (2 x age)	SAP ≥ 100	Age appropriate SAP
Urine output	1 to 2 ml/kg/h	1 to 1.5 ml/kg/h	0.5 to 1 ml/kg/h	1 to 2 ml/kg/h

In patients with oliguria despite adequate fluid replacement:
dopamine IV: 5 to 15 µg/kg/min by IV pump
or
epinephrine IV: 0.1 to 0.5 µg/kg/min by IV pump
Stop the infusion after 48 hours, if fluid requirements can be met by the oral route or gavage.

Respiratory care

- In all cases: continuous inhalation of humidified oxygen, chest physiotherapy.
- Emergency surgical intervention if necessary: tracheotomy, chest escharotomy.
- Do not administer corticosteroids (no effect on oedema; predisposition to infection). No specific treatment for direct bronchopulmonary lesions.

Analgesia

See Pain management.

Nutrition

Start feeding early, beginning at H8:
- Daily needs in adults
  - calories: 25 kcal/kg + 40 kcal/% SCB
  - proteins: 1.5 to 2 g/kg
- High energy foods (NRG5, Plumpy'nut, F100 milk) are necessary if the BSA is > 20% (normal food is inadequate).
- Nutritional requirements are administered according to the following distribution: carbohydrates 50%, lipids 30%, proteins 20%.
- Provide 5-10 times the recommended daily intake of vitamins and trace elements.
- Enteral feeds are preferred: oral route or nasogastric tube (necessary if BSA > 20%).
- Start with small quantities on D1, then increase progressively to reach recommended energy requirements within 3 days.
- Assess nutritional status regularly (weigh twice weekly).
- Reduce energy loss: occlusive dressings, warm environment (28-33°C), early grafting; management of pain, insomnia and depression.

Patients at risk of rhabdomyolysis (deep and extensive burns, electrical burns, crush injuries to the extremities)

Monitor for myoglobinuria: dark urine and urine dipstick tests. If present, induce alkaline diuresis for 48 hours (20 ml of **8.4% sodium bicarbonate** per litre of RL) to obtain an output of 1 to 2 ml/kg/h. Do not administer dopamine or furosemide.

Control of infection

Precautions against infection are of paramount importance until healing is complete. Infection is one of the most frequent and serious complications of burns:
- Follow hygiene precautions (e.g. sterile gloves when handling patients).
- Rigorous wound management (dressing changes, early excision).
- Separate "new" patients (< 7 days from burn) from convalescent patients (≥ 7 days from burn).
- Do not administer antibiotherapy in the absence of systemic infection.
  Infection is defined by the presence of at least 2 of 4 following signs: temperature > 38.5°C or < 36°C, tachycardia, tachypnoea, elevation of white blood cell count by more than 100% (or substantial decrease in the number of white blood cells).
- In the event of systemic infection, start empiric antibiotic treatment:
  cefazolin IV
  Children > 1 month: 75 mg/kg/day in 3 divided doses
  Adults : 6 g/day in 3 divided doses
  + **ciprofloxacin** PO
  Children > 1 month: 30 mg/kg/day in 2 divided doses
  Adults: 1.5 g/day in 3 divided doses
- Local infection, in the absence of signs of systemic infection, requires topical treatment with silver sulfadiazine.

Other treatments

- **Omeprazole** IV from D1
  Children: 1 mg/kg once daily
  Adults: 40 mg once daily
- Tetanus immunization/prophylaxis (see Tetanus, Chapter 7).
- Thromboprophylaxis: **nadroparin** SC beginning 48 to 72 hours post-injury. High risk dosing protocol if the BSA is > 50% and/or in the event of high-voltage electrical injury; moderate risk dosing protocol if the BSA is 20 to 50% and/or in the event of burns of the lower limbs.
- Physiotherapy from D1 (prevention of contractures), analgesia is necessary.
- Intentional burns (suicide attempt, aggression): appropriate psychological follow-up.

III. Local treatment

Regular dressing changes[a] prevent infection, decrease heat and fluid losses, reduce energy loss, and promote patient comfort. Dressings should be occlusive, assist in relieving pain, permit mobilisation, and prevent contractures.

- Basic principles
  - Rigorous adherence to the principles of asepsis.
  - Dressing changes require morphine administration in the non-anaesthetised patient.
  - The first dressing procedure is performed in the operating room under general anaesthesia, the following in an operating room under general anaesthesia or at the bedside with morphine.
- Technique
  - At the time of the first dressing procedure, shave any hairy areas (armpit, groin, pubis) if burns involve the adjacent tissues; scalp (anteriorly in the case of facial burns, entirely in the case of cranial burns). Cut nails.
  - Clean the burn with polyvidone iodine scrub solution (1 volume of 7.5% PVI + 4 volumes of 0.9% sodium chloride or sterile water). Scrub gently with compresses, taking care to avoid bleeding.

[a] Open technique « naked burn patient under a mosquito net » and water immersion therapy are obsolete and should no longer be used.

- Remove blisters with forceps and scissors.
- Rinse with 0.9% sodium chloride or sterile water.
- Dry the skin by blotting with sterile compresses.
- Apply **silver sulfadiazine** directly by hand (wear sterile gloves) in a uniform layer of 3-5 mm to all burned areas (except eyelids and lips).
- Apply a greasy dressing (Jelonet® or petrolatum gauze) using a to-and-fro motion (do not use circular dressings).
- Cover with a sterile compresses, unfolded into a single layer. Never encircle a limb with a single compress.
- Wrap with a crepe bandage, loosely applied.
- Elevate extremities to prevent oedema; immobilise in extension.

– Frequency: routinely every 48 hours; daily in the event of superinfection or in certain areas (e.g. perineum).

– Monitoring
  - Distal ischaemia of the burned limb is the main complication during the first 48 hours. Assess for signs of ischaemia: cyanosis or pallor of the extremity, dysaesthesia, hyperalgia, impaired capillary refill.
  - Monitor daily: pain, bleeding, progression of healing and infection.

IV. Surgical care

– *Emergency surgical interventions*
  - Escharotomy: in the case of circumferential burns of arms, legs or fingers, in order to avoid ischaemia, and circumferential burns of chest or neck that compromise respiratory movements.
  - Tracheotomy: in the event of airway obstruction due to oedema (e.g. deep cervicofacial burns). Tracheotomy can be performed through a burned area.
  - Tarsorrhaphy: in the event of ocular or deep eyelid burns.
  - Surgery for associated injuries (fractures, visceral lesions, etc.).

– *Burn surgery*
  - Excision-grafting of deep burns, in the operating room, under general anaesthesia, between D5 and D6: excision of necrotic tissue (eschar) with simultaneous grafting with autografts of thin skin. This intervention entails significant bleeding risk, do not involve more than 15% of BSA in the same surgery.
  - If early excision-grafting is not feasible, default to the process of sloughing- granulation-re-epithelisation. Sloughing occurs spontaneously due to the action of sulfadiazine/ petrolatum gauze dressings and, if necessary, by mechanical surgical debridement of necrotic tissue. This is followed by granulation, which may require surgical reduction in the case of hypertrophy. The risk of infection is high and the process is prolonged (> 1 month).

V. Pain management

All burns require analgesic treatment. Pain intensity is not always predictable and regular assessment is paramount: use a simple verbal scale (SVS) in children > 5 years and adults and NFCS or FLACC scales in children < 5 years (see Pain, Chapter 1).

Morphine is the treatment of choice for moderate to severe pain. Development of tolerance is common in burn patients and requires dose augmentation. Adjuvant treatment may complement analgesic medication (e.g. massage therapy, psychotherapy).

Continuous pain (experienced at rest)

– Moderate pain:
paracetamol PO: 60 mg/kg/day in 4 divided doses
+ **tramadol** PO: 4 to 8 mg/kg/day in 4 divided doses

– Moderate to severe pain:
paracetamol PO: 60 mg/kg/day in 4 divided doses
+ **slow release morphine** PO: 1 to 2 mg/kg/day in 2 divided doses at 12 hour-interval. In patients with severe burns, oral drugs are poorly absorbed in the digestive tract during the first 48 hours. Morphine must be administered by SC route: 0.2 mg/kg every 4 hours.

Acute pain experienced during care

Analgesics are given in addition to those given for continuous pain.

– Significant medical interventions and extensive burns: general anaesthesia in an operating room.

– Limited non-surgical interventions (dressings, painful physiotherapy):
  • Mild to moderate pain, 60 to 90 minutes before giving care:
  codeine PO or **tramadol** PO (see Pain, page 31, Chapter 1) rarely allows treatment to be completed comfortably. In the event of treatment failure, use morphine.
  • Moderate or severe pain, 60 to 90 minutes before giving care:
  immediate release morphine PO: initial dose of 0.5 to 1 mg/kg. The effective dose is usually around 1 mg/kg, but there is no maximum dose.
  or **morphine** SC: initial dose of 0.2 to 0.5 mg/kg. The effective dose is usually around 0.5 mg/kg, but there is no maximum dose.

  Note: doses given are for adults.
  For paracetamol, dosing is the same in children.
  For tramadol and codeine, dosing is the same in children > 6 months.
  For morphine, dosing is the same in children > 1 year, should be halved in children less than 1 year, and quartered in infants less than 3 months.

– Pain management using morphine during dressing changes at the bedside requires:
  • A trained nursing team.
  • Availability of immediate release oral morphine and naloxone.
  • Close monitoring: level of consciousness, RR, pulse, SaO2, every 15 min for the first hour following dressing change, then routine monitoring.
  • Assessment of pain intensity and sedation during the intervention and for 1 hour thereafter.
  • Necessary equipment for ventilation by mask and manual suction.
  • Gentle handling of the patient at all times.

– Adjustment of morphine doses for subsequent dressings:
  • If pain intensity (SVS) is 0 or 1: continue with the same dose.
  • If SVS score ≥ 2: increase the dose by 25 to 50%. If pain control remains inadequate, the dressing change should be carried out in the operating room under anaesthesia.

– Take advantage of the residual analgesia following dressing changes to carry out physiotherapy.

– As a last resort (morphine unavailable and no facilities to give general anaesthesia), in a safe setting (trained staff, resuscitation equipment, recovery room), adding **ketamine** IM at analgesic doses (0.5 to 1 mg/kg) reinforces the analgesic effect of the paracetamol + tramadol combination given before a dressing change.

Chronic pain (during the rehabilitation period)

– The treatment is guided by self-evaluation of pain intensity, and utilises paracetamol and/or tramadol. Patients may develop neuropathic pain (see Pain, page 34, Chapter 1).
– All other associated pain (physiotherapy, mobilization) should be treated as acute pain.

Minor burns

(outpatient treatment)

– Wound care: dressings with silver sulfadiazine or petrolatum gauze (except for first- degree superficial burns).
– Pain: paracetamol ± tramadol usually suffices.

Abscesses

An abscess is a collection of pus in the soft tissues most commonly due to *Staphylococcus aureus*.

During the suppurative stage, a 'ripe' abscess is red, inflamed, painful, shiny and swollen. It is usually fluctuant on palpation and may be fistulated. At this stage, the abscess cavity is inaccessible to antibiotics and surgical drainage is the only effective treatment.

During the early indurated stage, that precedes the suppurative stage medical treatment may be effective.

Treatment

Indurated stage

– Antibiotic therapy:
amoxicillin PO
Children: 80 mg/kg/day in 3 divided doses
Adults: 3000 mg/day in 3 divided doses
+ **metronidazole** PO
Children: 30 to 50 mg/kg/day in 3 divided doses
Adults: 1500 mg/day in 3 divided doses
or
amoxicillin/clavulanic acid (**co-amoxiclav**) PO, only if formulations in a ratio 8:1 or 7:1 are available. The dose is expressed in amoxicillin:
Children < 40 kg: 80 mg/kg/day in 2 to 3 divided doses
Children ≥ 40 kg and adults: 2500 to 3000 mg/day in 3 divided doses depending on formulation available:
  • ratio 8:1 : 3000 mg/day = 2 tablets of 500/62.5 mg, 3 times/day
  • ratio 7:1 : 2625 mg/day = 1 tablet of 875/125 mg, 3 times/day

– Adapt analgesics to the pain level (see Pain, Chapter 1).

– Apply compresses soaked with warm water 2 to 3 times/day.

If there is improvement after 48 hours: continue antibiotic treatment for 5 days to complete 7 days of treatment.
If there is no improvement after 48 hours of correct treatment: treat surgically.

Suppurative stage

Surgical drainage

Material

– Sterile scalpel handle and blade
– Sterile curved, non-toothed artery forceps (Kelly type)
– Sterile gloves
– Antiseptic
– 5 or 10 ml syringe
– Non-absorbable sutures
– Sterile corrugated drain

Anaesthesia

With the exception of paronychia, local anaesthesia of the abscess is usually impossible. General anaesthesia may be indicated, using:
ketamine IM: 10 mg/kg

Technique

Incision (Figure 8a)

- Hold the scalpel between the thumb and middle finger of the dominant hand, the index finger presses on the handle. Hold the abscess between the thumb and index finger of the other hand. The scalpel blade should be perpendicular to the skin.
- The incision is made in a single stroke along the long axis of the abscess. The incision must be long enough for a finger to be inserted.
- Be cautious when excising an abscess located over a blood vessel (carotid, axillary, humeral, femoral, popliteal).



Figure 8a
Incision with a scalpel

Digital exploration (Figure 8b)

- Explore the cavity with the index finger, breaking down all loculi (a single cavity should remain), evacuate the pus and explore to the edges of the cavity.
- The exploration also allows an assessment of the extent of the abscess, the depth, and location with respect to underlying structures (arterial pulsation) or any possible contact with underlying bone. In this last case, seek surgical advice.

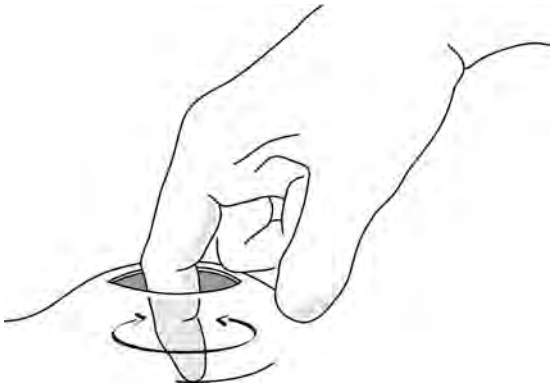


Figure 8b
Exploration of the cavity, breaking down any loculi

Washing

Abundant washing of the cavity using a syringe filled with antiseptic solution.

Drainage (Figure 8c)

Insert a drain (or, failing that a gauze wick) into the base of the cavity. If possible, fix it to the edge of the incision with a single suture. The drain is withdrawn progressively and then, after 3 to 5 days removed completely.

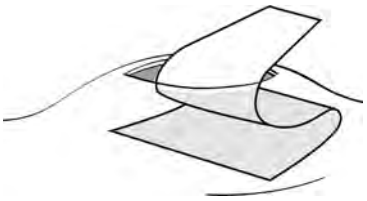


Figure 8c
Drain fixed to the skin

Special sites

Breast abscesses

(Figures 9a to 9d)

– Breast abscesses are usually superficial, but deep ones, when they occur, are more difficult to diagnose and drain.

Indurated stage: medical treatment

– Antibiotic treatment (see above)
– Apply a constrictive bandage, stop breast-feeding from the infected breast; express milk using a breast pump to avoid engorgement.

Suppurative stage: surgical drainage

– Incision:
  • radial for superficial abscesses,
  • peri-areolar for abscesses near the nipple,
  • submammary for deep abscesses.
– Gentle exploration with a finger.
– Wash abundantly with a syringe filled with an antiseptic solution.
– Insert a corrugated drain.



Figure 9a
Locations of breast abscesses

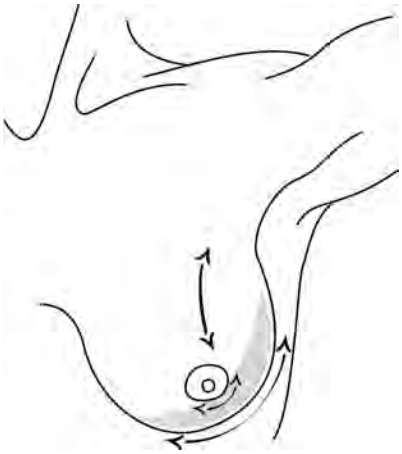


Figure 9b
Incisions: radial, peri-areolar, submammary



Figure 9c
Submammary incision

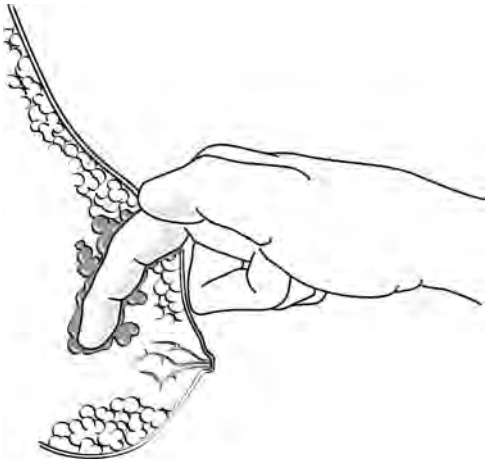


Figure 9d
Gentle exploration with a finger, breaking down any loculi

Parotid abscess

There is a risk of severing the facial nerve when incising a parotid abscess. The incision should be horizontal along the lower margin of the abscess.

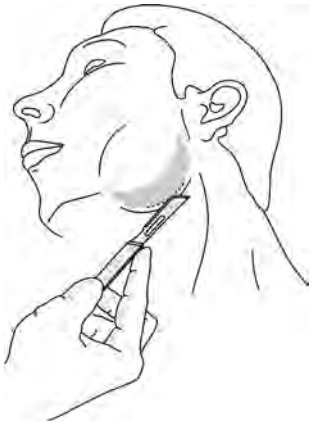


Figure 10
Incision of a parotid abscess

Pyomyositis

– Pyomyositis is an infection of the muscle, almost always due to *Staphylococcus aureus*. It most commonly affects the muscles of the limbs and torso. These infections may occur simultaneously in multiple sites.
– During the early indurated stage, while the muscle is swollen, hot and painful, medical treatment may be effective. During the suppurative stage, when the abscess has formed, surgical drainage is the only effective treatment.

Treatment

Indurated stage

– Immobilise the limb.
– Antibiotic therapy as for other abscesses (see Abscesses).
– Adapt analgesics to the pain level (see Pain, Chapter 1).
– Apply compresses soaked in 70% alcohol, 2 times/day (maximum of 3 times/day to prevent burns to the skin).

Suppurative stage

Treatment of pyomyositis is by incision following the rules for incision of abscesses (see page 295). Muscle abscesses are often deeper than other abscesses. As a result, needle aspiration with a large bore needle may be necessary to locate the abscess; it yields thick pus. Needle aspiration is insufficient treatment even if pus is evacuated.

Material and anaesthesia

As for abscesses.

Technique

– Generous incision along the axis of the limb, over the site of the abscess and avoiding underlying neurovascular stuctures; incise the skin, subcutaneous tissues and muscular fascia with a scalpel (Figure 11a).
– Dissect the muscle fibres with non-toothed forceps (Kelly type) or round tipped scissors. Insert the instrument into the muscle until the purulent cavity is reached. During insertion, keep the instrument closed and perpendicular to the muscle fibres. Withdraw gently with the scissors or forceps slightly open, keeping instrument perpendicular to the fibres (Figure 11b).
– Use a forefinger to explore the cavity, break down any loculi and evacuate the pus (Figure 11c).
– Wash abundantly with antiseptic solution.
– Insert a large drain.
– Fix the drain to the edge of the wound using a single suture. Remove the drain on about the 5th day (Figure 11d).

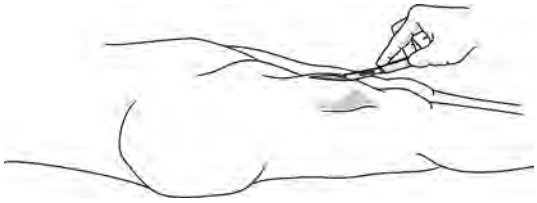


Figure 11a
Long incision

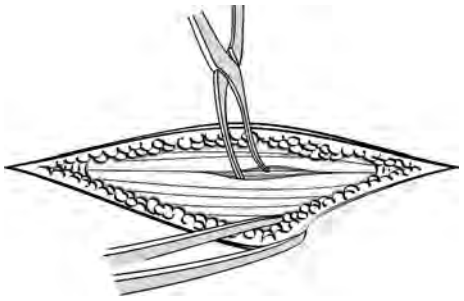


Figure 11b
Dissection of the muscle using Kelly forceps, insert closed then withdraw with the instrument slightly open



Figure 11c
Exploration and evacuation of pus with the finger



Figure 11d
Drain fixed to the skin

Figures 11
Surgical drainage of a pyomyositis

Special site

Myositis of the psoas muscle: if the abscess is on the right side, the clinical signs are the same as for appendicitis with pain in the right iliac area. Transfer the patient to a surgical centre.

Leg ulcers

– Leg ulcers are chronic losses of cutaneous tissue. They are common in tropical regions, resulting from varied aetiologies:
  • vascular: venous and/or arterial insufficiency,
  • bacterial: leprosy, Buruli ulcer (*Mycobacterium ulcerans*), phagedenic ulcer, yaws, syphilis,
  • parasitic: dracunculiasis (Guinea-worm disease), leishmaniasis,
  • metabolic: diabetes,
  • traumatic: trauma is often a precipitating factor combined with another underlying cause/
– The history of the disease and a complete clinical examination (paying particular attention to the neurological examination to determine if there is a peripheral neuropathy caused by leprosy or diabetes) usually leads to an aetiological diagnosis.
– All ulcers may become complicated with either local or regional secondary infections (abscess, lymphadenopathy, adenitis, osteomyelitis, erysipela, pyodermitis), generalised infection (septicaemia), tetanus and after many years of evolution, skin cancer.

Daily local treatment

– Bathe the leg for 10 to 15 minutes in **NaDCC** or **chloramine** and rinse in boiled water.
– Remove any necrotic (black) and fibrinous (yellowish) tissue using compresses or excise the tissue with a scalpel.
– Apply:
  • to a clean ulcer, with little discharge: **10% polyvidone iodine** and vaseline;
  • to a dirty ulcer, with little discharge: **silver sulfadiazine**;
  • to an oozing ulcer: **10% polyvidone iodine** alone;
  • o multiple or extensive ulcers with no discharge: **silver sulfadiazine** (monitor for systemic adverse effects);
  • to multiple or extensive oozing ulcers: diluted **polyvidone iodine** (1/4 of 10% polyvidone + 3/4 of 0.9% NaCl or clean water) for one minute then rinse with 0.9% NaCl or clean water to reduce the risk of transcutaneous iodine absorption.
– Cover with a dry sterile dressing.

Systemic treatment

– Treatment with analgesics in the event of pain: adapt the level and dosage to the individual (see Pain, Chapter 1).
– Give systemic antibiotics in case of:
  • Secondary infection (see Bacterial skin infections, Chapter 4).

- Phagedenic ulcer (in the early stages, antibiotics may be useful. They are often ineffective in the chronic stages):

  doxycycline PO (except in children under 8 years and pregnant or lactating women)
  Children over 8 years: 4 mg/kg once daily
  Adults: 200 mg once daily
  or
  metronidazole PO
  Children: 30 mg/kg/day in 3 divided doses
  Adults: 1.5 g/day in 3 divided doses

  If after 7 days, antibiotherapy is effective, change to oral treatment by using **phenoxymethylpenicillin** PO in the same dosages (or continue the treatment with doxycycline or metronidazole as above).Treatment duration varies according to the clinical evolution.

– Treat the cause.

– Complementary therapy:
  - Elevate the legs in cases of venous and/or lymphatic insufficiency.
  - Give tetanus prophylaxis if appropriate (see Tetanus, Chapter 7).
  - Skin graft if the ulcer is extensive, clean, red and flat. Skin grafts are often necessary after surgical excision to heal phagedenic and Buruli ulcers.

Necrotising infections of the skin and soft tissues

– These infections are characterized by the invasion of the soft tissues: skin, subcutaneous tissue, superficial or deep fascia, muscles. They include necrotizing cellulitis, necrotizing fasciitis, myonecrosis, gas gangrene, etc.
– The clinical presentation depends on the causative organism and the stage of progression. Group A streptococcus is frequently isolated as are *Staphylococcus aureus*, enterobacteriaceae and anaerobic bacteria including *Clostridium* spp.
– The delay in treatment of a minor wound and certain types of wounds such as gunshot wounds or stabbings, open fractures or non-sterile intramuscular injections/circumcisions, favour the development of a necrotizing infection. The risk factors for a necrotizing infection are immunosuppression, diabetes, malnutrition and advanced age in adults and malnutrition, varicella and omphalitis in children.
– A necrotizing infection is a surgical emergency and has a poor prognosis.

Clinical features

– Early in the infection, it may be difficult to differentiate necrotizing infections from non-necrotizing infections. Initial signs and symptoms of erythema, swelling and pain can resemble cellulitis. Location depends on the portal of entry.
– Lesions progress rapidly despite antibiotic therapy, with the development of the typical signs of a necrotizing infection: pain disproportionate to appearance and tense oedema outside the area of erythema, followed by haemorrhagic blisters and necrosis (cold bluish or blackish hypoaesthetic macules).
– Signs of late infection: crepitus on palpation and fetid odour (gas gangrene).
– Necrotizing infections are associated with signs of a severe systemic infection: altered mental status, hypotension and shock.

Laboratory

– If available, the following tests can help identify an early necrotizing infection: white blood cell count > 15 000/mm³ or < 4000/mm³; serum creatinine > 141 µmol/l; serum glucose > 10 mmol/l (180 mg/dl) or < 3.3 mmol/l (60 mg/dl).
– Obtain specimens for bacterial culture in the operating room and blood cultures if possible.

Treatment

Prompt surgical management accompanied by IV antibiotic therapy may at times reduce the high mortality. In case of septic shock, stabilize the patient prior to surgical transfer.

– Emergency surgical treatment:
  • Debridement, drainage, wide excision of necrotic tissue and rapid amputation if necessary.
  • Surgical re-evaluation within 24 to 36 hours to check for eventual progression of the necrosis and need for further debridement.

– Triple antibiotic therapy for at least 10 to 14 days or more depending on clinical response:
amoxicillin/clavulanic acid (**co-amoxiclav**) slow IV injection (3 minutes) or IV infusion (30 minutes)[a]
Children less than 3 months: 100 mg/kg/day in 2 divided doses
Children ≥ 3 months and < 40 kg: 150 mg/kg/day in 3 divided doses (max. 6 g/day)
Children ≥ 40 kg and adults: 6 g/day in 3 divided doses
+
clindamycin IV infusion (30 minutes)[b]
Neonates 0 to 7 days (< 2 kg): 10 mg/kg/day in 2 divided doses
Neonates 0 to 7 days (≥ 2 kg): 15 mg/kg/day in 3 divided doses
Neonates 8 days to < 1 month (< 2 kg): 15 mg/kg/day in 3 divided doses
Neonates 8 days to < 1 month (≥ 2 kg): 30 mg/kg/day in 3 divided doses
Children 1 month and over: 40 mg/kg/day in 3 divided doses (max. 2700 mg/day)
Adults: 2700 mg/day in 3 divided doses
+
gentamicin slow IV injection (3 minutes) or IV infusion (30 minutes)[b]
Neonates 0 to 7 days (< 2 kg): 3 mg/kg once daily
Neonates 0 to 7 days (≥ 2 kg): 5 mg/kg once daily
Neonates 8 days to < 1 month: 5 mg/kg once daily
Children 1 month and over and adults: 6 mg/kg once daily

Stop gentamicin after 48 hours if on surgical second look there is no evidence of progression of necrosis or if cultures do not grow *Pseudomonas aeruginosa*.

– Other treatments:
  - Deep vein thrombosis prophylaxis;
  - Appropriate management of pain (see Pain, Chapter 1);
  - Early nutritional support.

[a] Dilute each dose of amoxicillin/clavulanic acid in 5 ml/kg of 0.9% sodium chloride in children less than 20 kg and in a bag of 100 ml of 0.9% sodium chloride in children over 20 kg and in adults. Do not dilute in glucose.

[b] Dilute each dose of clindamycin or gentamicin in 5 ml/kg of 0.9% sodium chloride or 5% glucose in children less than 20 kg and in a bag of 100 ml of 0.9% sodium chloride or 5% glucose in children over 20 kg and in adults.

Venomous bites and stings

Snake bites and envenomation

– More than 50% of the bites are dry bites, i.e. no envenomation occurred. In the event that venom is injected, the severity of envenomation depends on the species, the amount of venom injected, the location of the bite (bites on the head and neck are the most dangerous) and the weight, general condition and age of the individual (more serious in children).

– It is rare that the snake involved is identified. However, observation of the clinical signs may orient diagnosis and management. Two major syndromes are identified:
  • neurological disorders that evolve towards respiratory muscle paralysis and coma are common manifestations of elapid envenomation (cobra, mamba, etc.);
  • extensive local lesions (intense pain, inflammation with oedema and necrosis) and coagulation abnormalities are common manifestations of viperid or crotalid (rattle snake) envenomation.

  Clinical manifestations and management of bites and envenomations are described in the following page.

– Early diagnosis and monitoring of coagulation abnormalities is based on whole blood clotting tests performed in a dry tube (at the patient's arrival and then every 4 to 6 hours for the first day).
  Take 2 to 5 ml of whole blood, wait 30 minutes and examine the tube:
  • Complete clotting: no coagulation abnormality
  • Incomplete clotting or no clotting: coagulation abnormality, susceptibility to bleeding[a]

  In the event of coagulation abnormalities, continue to monitor once daily until coagulation returns to normal.

– Aetiological treatment is based on the administration of snake antivenom serum, only if there are clear *clinical manifestations of envenomation* or *coagulation abnormalities* are observed.
  Antivenom sera are effective, but rarely available (verify local availability) and difficult to store. Antivenom serum should be administered as early as possible: by IV infusion (in 0.9% sodium chloride) if using a poorly purified serum; by slow IV in the event of severe envenomation if the serum is known to be well purified. Repeat antivenom serum administration after 4 or 6 hours if the symptoms of envenomation persist.

  ⚠ For all patients, be prepared for an anaphylactic reaction, which, despite its potential severity (shock), is usually more easily controlled than coagulation disorders or serious neurological disorders.

– In asymptomatic patients (bites without signs of envenomation and with normal coagulation), monitoring must continue for at least 12 hours (24 hours preferred).

[a] There can be a considerable delay between the decrease in coagulation factors (less than 30 minutes after the bite) and the first signs of bleeding (other than bleeding at the site of the bite and/or the development of sero-sanguinous blisters), which may appear only 3 days after the bite. Conversely, bleeding may resolve prior to normalization of coagulation parameters.

Clinical signs and treatment

Time since bite	Clinical manifestations	Possible aggressor	Treatment
Bite			
0	Fang marks Pain at the site of bite	?	Strict rest, immobilisation of the limb with a splint to slow the diffusion of venom[a]. Wound cleansing. Tetanus prophylaxis (Tetanus, Chapter 7). Observe for manifestations of envenomation. A the dispensary level, prepare patient evacuation to a referral centre.
Envenomation			
10-30 minutes	Hypotension, myosis, excessive salivation and sweating, dysphagia, dyspnoea Local paraesthesia, paresis	Elapids	Insert a peripheral IV line. IV antivenom serum as soon as possible.
	Inflammatory syndrome: intense pain, extensive regional oedema	Viperids Crotalids	Insert a peripheral IV line. IV antivenom serum as soon as possible. Analgesics[b]. IV or PO[b] anti-inflammatories.
30 minutes-5 hours	Cobra syndrome: bilateral eyelid drooping, trismus, respiratory muscle paralysis Shock	Elapids	Intubation and assisted ventilation. See Shock, Chapter 1.
30 minutes-48 hours	Haemorrhagic syndome: epistaxis, purpura, haemolysis or disseminated intra-vascular coagulation Shock	Viperids Crotalids	Monitor coagulation (blood clotting test in a dry tube). Transfusion of fresh blood in the event of severe anaemia. See Shock, Chapter 1.
6 hours or more	No signs or changes in coagulation (non-venomous snakes or snake bite without envenomation)	?	Reassure the patient. Send him home after 12 hours.
	Tissue necrosis		Remove blisters, clean; daily (non occlusive) dressings. Surgical intervention for necrosis, depending on the extent, after the lesions stabilise (minimum 15 days).

a Tourniquets, incision-suction and cauterisation are ineffective and may be dangerous.
b Do not use acetylsalicylic acid (aspirin).

– In case of clinical evidence of infection only: drainage of any abscess; amoxicillin/clavulanic acid (co-amoxiclav) for 7 to 10 days in case of cellulitis.
Infections are relatively rare, and most often associated with traditional treatment or with nosocomial transmission after unnecessary or premature surgery.

Scorpion stings and envenomation

– In most cases, the sting causes local effects including: pain, oedema, erythema. Management includes strict rest, wound cleansing, analgesics PO, and tetanus prophylaxis (see Tetanus, Chapter 7). In patients with significant pain, infiltrate the area around the sting with local anaesthetic (**1% lidocaine**). Observe for 12 hours.

– General signs appear in the event of severe envenomation: hypertension, excessive salivation and sweating, hyperthermia, vomiting, diarrhoea, muscle pain, respiratory difficulties, seizures; rarely, shock.

– Aetiological treatment:
  The use of scorpion antivenom sera is controversial (most of them are not very effective; they may be poorly tolerated due to insufficient purification).
  In practice, in countries where scorpion envenomations are severe (North Africa, the Middle East, Central America and Amazonia), check local availability of antivenom sera and follow national recommendations.
  The criteria for administration are the severity of the envenomation, the age of the patient (more severe in children) and the time elapsed since the sting. This should not exceed 2 to 3 hours. If the time elapsed is more than 2 or 3 hours, the benefit of antivenom serum is poor in comparison with the risk of anaphylaxis (in contrast to envenomation by snakes).

– Symptomatic treatment:
  • In the event of vomiting, diarrhoea or excessive sweating: prevention of dehydration (oral rehydration salts), especially in children.
  • In the event of muscle pain: **10% calcium gluconate** slow IV (children: 5 ml/injection, adults: 10 ml/injection, administered over 10 to 20 minutes).
  • In the event of seizures: diazepam may be used with caution; the risk of respiratory depression is increased in envenomated patients (see Seizures, Chapter 1).

Spider bites and envenomation

– Treatment is usually limited to wound cleansing, strict rest, analgesics PO and tetanus prophylaxis (see Tetanus, Chapter 7).

– Severe envenomations are rare. There are two main clinical syndromes:
  • *Neurotoxic syndrome* (black widow spider): severe muscle pain, tachycardia, hypertension, nausea, vomiting, headache, excessive sweating. The signs develop for 24 hours and then resolve spontaneously over a few days.
  • *Necrotic syndrome* (recluse spider): local tissue lesions, possible necrosis and ulceration; mild general signs (fever, chills, malaise and vomiting) which usually resolve over a few days. If present, haemolysis may sometimes be life threatening.

  As well as the general measures listed above, treatment includes administration of **10% calcium gluconate** by slow IV in the event of muscle spasms (children: 5 ml/injection, adults: 10 ml/injection, administered over 10 to 20 minutes).
  Incision and debridement of necrotic tissue are not recommended (not useful; may impair healing).

Hymenoptera stings (honeybees, wasps and hornets)

– Local care: remove the embedded sting (bee), clean with soap and water; if pruriginous, apply **calamine** lotion.

– Analgesics if necessary (paracetamol PO).

– In the event of an anaphylactic reaction:

epinephrine (**adrenaline**) IM
Use *undiluted* epinephrine solution (1:1000 = 1 mg/ml) and a 1 ml syringe graduated in 0.01 ml in children:

Children under 6 years:	0.15 ml
Children from 6 to 12 years:	0.3 ml
Children over 12 years and adults:	0.5 ml

For children, if 1 ml syringe is not available, use a *diluted* solution, i.e. add 1 mg epinephine to 9 ml of 0.9% sodium chloride to obtain a 0.1 mg/ml solution (1:10 000):

Children under 6 years:	1.5 ml
Children from 6 to 12 years:	3 ml

Repeat after 5 minutes if no clinical improvement.

Use IV epinephrine (for doses, see Anaphylactic shock, page 17, Chapter 1) in patients with circulatory collapse or those who deteriorate despite receiving IM epinephrine.

Dental infections

Infection arising as a secondary complication of an inflammation of the dental pulp. The severity and the treatment of dental infections depend on their evolution: localised to the infected tooth, extended to adjacent anatomical structures or diffuse infections.

Clinical features and treatment

Infection localised to a tooth and its surroundings (acute dental abscess)

– Intense and continuous pain.
– On examination: swelling limited to the gum surrounding the infected tooth. Purulent exudate may be present draining either through the root canal, or through the periodontal ligament (loosening the tooth) or through a gingival fistula. There are no signs of the infection extending to adjacent anatomical structures nor general signs of infection.
– Treatment:
  • Treatment is only surgical (the source of infection is inaccessible to antibiotics): root canal therapy (disinfection of the root canal) if possible or extraction of the tooth.
  • Pain: paracetamol or ibuprofen PO (see Pain, Chapter 1).

Infections extending to adjacent anatomical structures (acute dento-alveolar abscess)

Local spreading of an acute dental abscess into the surrounding bone and tissue.

– Painful gingival and buccal swelling with warm and tender skin, developing into a ripe abscess: intense pain, with trismus, particularly if the infection is in a posterior tooth, presence of general signs (fever, fatigue, cervical lymphadenopathy).
– In patients with acute gangrenous cellulitis (crepitations on palpation), treat as an infection extending into the cervico-facial tissues (see below).
– Treatment:
  • First surgical: incision and drainage of the pus or extraction of the tooth.
  • Then antibiotic treatment for 5 days following the procedure: **amoxicillin** PO
    Children: 50 mg/kg/day in 2 divided doses
    Adults: 2 g/day in 2 divided doses
    Notes:
    If the dental procedure has to be delayed (local anaesthesia not possible due to inflammation, significant trismus), start with antibiotic treatment, but the dental procedure must be completed in the following days.
    If there is no improvement within 48 to 72 hours after the dental procedure, do not change antibiotic, but start a new procedure on the tooth.
  • Pain: paracetamol or ibuprofen PO (see Pain, Chapter 1).

Infections extending into the cervico-facial tissues

– Extremely serious cellulitis, with rapidly spreading cervical or facial tissue necrosis and signs of septicaemia.
– Treatment:
  • treatment in an intensive care unit.
  • high dose antibiotic treatment (see Necrotising infections of the skin and soft tissues).
  • extraction of the tooth.

Chapter 11:
Mental/psychical disorders in adults

Anxiety

Insomnia

Agitation

Mental confusion

Post-traumatic stress disorder

Depression

Psychotic disorders

- *Acute psychotic episode*
- *Chronic psychoses*
- *Bipolar disorder*

Anxiety

A patient suffering from anxiety has:
– psychical symptoms: pervasive worries, e.g. fear of having a serious illness, fear with no clearly-defined object or phobias;
– behavioural changes: nervousness, avoidance behaviour;
– physical symptoms: e.g., dry mouth, "lump in the throat," nonspecific complaints (e.g. feeling of malaise, hot flashes or chills, diffuse pain).

Anxiety is a common feature in depression, post-traumatic stress disorder and psychosis). It can also occur in isolation, not associated with any other mental disorders. Anxiety disorders often occur immediately after a difficult life event.

Management

Try to determine the source of the anxiety and reassure the patient. If necessary, use simple relaxation techniques to alleviate the symptoms[a].

If symptoms are exacerbated (e.g., tachycardia, feeling of suffocation, fear of dying or "going crazy," agitation, or conversely, prostration), it may be necessary to administer **diazepam**: 5 to 10 mg PO or 10 mg IM, to be repeated after one hour if required.

Severe anxiety may justify a short course[b] (one to two weeks max.) of **diazepam** PO: 5 to 10 mg/day in 2 divided doses; reducing the dose by half in the last few days of treatment.Si If symptoms recur after treatment discontinuation, do not resume diazepam.
Haloperidol PO at very low dose and for a short period of time (1 mg/day in 2 divided for maximum 2 to 4 weeks) may be used for its anxiolytic properties if a treatment is still needed. However, before prescribing haloperidol, re-evaluate for possible depression or post-traumatic stress disorder (see Post-traumatic stress disorder and Depression).

For generalised anxiety, an antidepressant with anxiolytic properties is preferred (**paroxetine** PO: 10 to 20 mg maximum once daily at bedtime), to be continued for 2 to 3 months after symptoms resolve then, stop gradually over 2 weeks.

For recurring attacks (panic disorder), **clomipramine** PO may be prescribed to prevent recurrences: 25 mg once daily, to be gradually increased to 75 mg once daily. Continue for 2 to 3 months after symptoms resolve then, stop gradually (over 3 to 4 weeks) while monitoring the patient for recurrence of symptoms.

[a] For example, in case of hyperventilation, use a technique that controls the respiratory rate: get the patient in a comfortable position with his eyes closed. Help him focus on his breathing so that it becomes calmer and more regular, with three-phase breathing cycles: inhalation (count to three), exhalation (count to three), pause (count to three), etc.

[b] Treatment should be short as benzodiazepines can cause dependence and tolerance.

Insomnia

Complaints may be: difficulty falling or remaining asleep, waking up too early in the morning, nightmares, or daytime fatigue.

Management

If the insomnia is related to an organic cause, treat the cause (e.g., administer analgesics for pain).

If the insomnia is related to the use of alcohol, drugs or a medication[a], management depends on the substance responsible.

If the insomnia is related to a particular life event (e.g. bereavement), a short term treatment with a sedating antihistamine (**promethazine** PO: 25 mg once daily at bedtime for 8 to 10 days) may be useful.

If the insomnia persists, re-evaluate the patient. Insomnia is a common feature in depression, post-traumatic stress disorder and anxiety disorders. In such cases, the underlying disorder should be addressed.

[a] The main drugs known to cause sleep problems are corticosteroids, beta blockers, levodopa/carbidopa, levothyroxin (if overdosage), phenytoin, fluoxetine and clomipramine.

Agitation

Patients with anxiety or psychotic or personality disorders, or mental confusion may have periods of psychomotor agitation.
Agitation is also common in acute intoxication (alcohol/drugs) and withdrawal syndrome (e.g. delirium tremens or abrupt interruption of antidepressant therapy).
It may be accompanied by oppositional behaviour, violence or fleeing.

Management

Clinical evaluation is best performed in pairs, in a calm setting, with or without the person's family/friends, depending on the situation.
It may be necessary to administer **diazepam** 10 mg PO to reduce the agitation and conduct the clinical exam.

If the patient is violent or dangerous, urgent sedation is required: **diazepam** IM 10 mg, to be repeated after 30 to 60 minutes if necessary.
Physical restraint may be required in certain circumstances. However, its use should be view as a temporary measure, always in combination with sedation and close medical supervision.

Determine whether or not the patient is confused; look for an underlying cause, e.g., neurological, metabolic, etc. (see Mental confusion). Management depends on the underlying cause.

If the agitation is associated with anxiety, see Anxiety; if associated with psychotic disorders, see Psychotic disorders.

Alcoholic patients can experience withdrawal symptoms within 6 to 24 hours after they stop drinking. In the early phase (pre-delirium tremens), the manifestations include irritability, a general feeling of malaise, profuse sweating and shaking. Withdrawal syndrome should be taken into consideration in patients who are hospitalised and therefore forced to stop drinking abruptly.
At a more advanced stage (delirium tremens), agitation is accompanied by fever, mental confusion and visual hallucinations (zoopsia).

Pre-DT symptoms can be prevented or treated with: **diazepam** PO (40 mg/day in 4 divided doses 6 hours apart for 1 to 3 days, then reduce and stop over 7 days) + oral hydration (3 litres of water/day) + **thiamine** IM (100 mg/day for at least 3 days).
In post-operative patients, start with the parenteral route: **diazepam** slow IV, 5 to 10 mg 4 times daily (for precautions, see delirium tremens below) + IV hydration (2 to 4 litres 0.9% sodium chloride/24 hours) + **thiamine** IM as above.

In case of delirium tremens (DT):
- Admit the patient to an intensive care unit.
- Administer **diazepam** IV: 10 to 20 mg 4 to 6 times/day, under close supervision with ventilation equipment near at hand. The goal is to achieve mild sedation without provoking respiratory depression. The doses and duration of the treatment are adapted according to the clinical progress.
- Add **chlorpromazine** IM if necessary: 25 to 50 mg 1 to 3 times/day.
- IV hydration: 2 to 4 litres 0.9% sodium chloride/24 hours.
- Administer **thiamine** IM: 100 mg/day for at least 3 days.
- Monitor vital signs and blood glucose levels.

Mental confusion

The clinical picture includes:
– disorientation in time and space;
– impaired consciousness;
– concentration problems;
– memory impairment.
These symptoms develop rapidly (hours or days), and often fluctuate during the course of the day.
Agitation, delusions, behavioural disorders and hallucinations (often visual) may complicate the picture.

Mental confusion almost always has an organic cause:
– Infectious: meningitis, cerebral malaria, encephalitis, septicaemia, syphilis, AIDS, etc.
– Metabolic: hyper/hypoglycaemia, electrolyte imbalance, niacin or B1 deficiencies, etc.
– Endocrine: thyroid disorders
– Neurological: epilepsy, raised intracranial pressure, head trauma, meningeal haemorrhage, brain tumour, etc.

Also consider treatment adverse effects (corticosteroids, opioid analgesics, psychotropic drugs, etc.), use of toxic substances (alcohol/drugs), or withdrawal from these substances (see delirium tremens, previous page).

Management

Mental confusion requires hospitalisation. Treat the underlying cause.

Post-traumatic stress disorder

An event is "traumatic" when someone has been directly confronted with death, either by seeing another person being killed or seriously injured as the result of violence, or by experiencing serious harm, such as a threat to his/her life or physical integrity (e.g. rape, torture). These events cause feelings of helplessness and horror.

Immediate, transitory disorders (prostration, disorientation, fleeing, automatic behaviours, etc.) are to be distinguished from secondary, long-lasting problems that appear several weeks or months after the event: post-traumatic stress, often associated with depression (Depression), or sometimes acute psychosis (Psychotic disorders), even in people with no history of psychotic symptoms.

Post-traumatic stress disorder (PTSD) is characterised by three types of psychological response, generally seen in combination:

– *Persistent re-experiencing*
  The patient describes:
  • images, thoughts or perceptions related to the traumatic experience, which intrude despite efforts to block them out, including at night in the form of distressing dreams;
  • flashbacks during which the patient "relives" parts of the traumatic scene.
– *Avoidance*
  The patient tries to avoid:
  • places, situations and people that might be associated with the trauma;
  • having thoughts or feelings related to the trauma; patients may use alcohol, drugs or any psychotropic agents for this purpose.
– *Increased arousal*
  Constant state of alert, exaggerated startle response, anxiety, insomnia, poor concentration. The patient may develop somatic symptoms such as hypertension, sweating, shaking, tachycardia, headache, etc.).

Re-experiencing is highly distressing and causes disorders that may worsen over time; people isolate themselves, behave differently, stop fulfilling their family/social obligations, and experience diffuse pain and mental exhaustion.

Management

Psychological intervention is essential to reduce the suffering, disabling symptoms and social handicaps resulting from PTSD.

It is important to reassure the patient that his symptoms are a comprehensible response to a very abnormal event. Sessions should be conducted with tact. The patient should be encouraged to talk about his experience. Avoid over active explorations of the patient's emotions: leave it to the patient to decide how far he wants to go.

Associated symptoms (anxiety or insomnia), if persistent, can be relieved by symptomatic treatment (diazepam) for no more than two weeks[a].

If the patient has severe symptoms (obsessive thoughts, pronounced arousal, etc.), the pharmacological treatment is paroxetine PO (see Anxiety).

[a] Benzodiazepines can lead to dependence and tolerance. They should be used only for severe conditions and for a limited amount of time.

Depression

Depression is characterised by a set of symptoms lasting at least two weeks and causing a change from the patient's previous functioning.

The classic diagnostic criteria for a major depressive episode are:
– Pervasive sadness and/or a lack of interest or pleasure in activities normally found pleasurable

And
– At least four of the following signs:
  • Significant loss of appetite or weight
  • Insomnia, especially early waking (or, more rarely, hypersomnia)
  • Psychomotor agitation or retardation
  • Significant fatigue, making it difficult to carry out daily tasks
  • Diminished ability to make decisions or concentrate
  • Feeling of guilt or worthlessness, loss of self-confidence or self-esteem
  • Feeling of despair
  • Thoughts of death, suicidal ideation or attempt

The features of depression can vary, however, from one culture to another[a]. For example, the depressed patient may express multiple somatic complaints rather than psychological distress. Depression may also manifest itself as an acute psychotic disorder in a given cultural context.

Management

When faced with symptoms of depression, consider an underlying organic cause (e.g., hypothyroidism or Parkinson's disease) or adverse effects from medical treatment (corticosteroids, cycloserine, efavirenz, levodopa, etc.). Look for a triggering event (e.g. rape, recent childbirth and post-partum depression).

Depressive symptoms are the most common psychical disorders in patients with severe chronic infectious diseases such as HIV infection or tuberculosis. These symptoms should not be neglected, especially as they have a negative impact on adherence to treatment.

Symptoms of depression are usual right after a major loss (bereavement, exile, etc.). They gradually subside, in most cases, with support from relatives. Psychological support may be useful.

Pharmacological treatment is justified if there is a risk of suicide or in the event of severe or long-lasting problems with significant impact on daily life, or if psychological follow-up alone is not enough.

Before prescribing, make sure that a 6-month treatment and follow-up (psychological support, adherence and response) is possible.

[a] Hence the importance of working with an "informant" (in the anthropological sense of the word) when dealing with unfamiliar cultural contexts.

Preferably use a serotonin reuptake inhibitor (SRI), particularly in elderly patients:
paroxetine PO: 20 mg once daily in the evening
or
fluoxetine PO: 20 mg once daily in the morning; use with caution in patients with severe anxiety disorders or who are immobilised (e.g., wounded).

If the depression is accompanied by severe anxiety, use **amitriptyline** PO instead: start with 25 mg once daily and gradually increase over one week to 75 mg once daily (150 mg/day maximum).
Be careful with tricyclic antidepressants, as the therapeutic dose is close to the lethal dose. In elderly patients, reduce the dose by half.

Depression is less frequent in pregnancy than in the postpartum period. In situations where antidepressants are required, use paroxetine rather than fluoxetine if the woman plans to breastfeed. In the event of pregnancy in a woman under antidepressants, re- evaluate the need to continue the treatment. If the treatment is still necessary, refer to the table below. Monitor newborns for signs of toxicity or withdrawal symptoms during the first few days of life.

Antidepressant therapy

	Fluoxetine (mg/day)				**Paroxetine** (mg/day)				**Amitriptyline** (mg/day)			
Week/month	**W1**	**W2**	**W3**	**M1**	**W1**	**W2**	**W3**	**M1**	**W1**	**W2**	**W3**	**M1**
Adults	20	20	20	40	20	20	20	40	25	50	75	100
> 60 years	idem				idem				25	25	50	75
Increase at M1 (end of the first month) only if still necessary.												
Breastfeeding	Avoid				Can be used				Can be used; monitor the infant (risk of drowsiness).			
Pregnancy	Can be used								Can be used; reduce the dose at the end of pregnancy.			

If SRIs are unavailable or poorly tolerated, **clomipramine** PO may also be use: start with 25 mg once daily at bedtime, and gradually increase over one week to 75 mg once daily (150 mg/day maximum).

There is a delay of 2 to 3 weeks before antidepressant effect occurs. During this period, anxiety may be exacerbated and the risk of suicide increased, especially with fluoxetine and clomipramine. **Diazepam** PO (5 to 10 mg/day in 2 divided doses) may be given for the first two weeks of treatment.

During the first month, the patient should be followed weekly. During this period, do not give more tablets than the quantity required for each week.

All serious depression carries the risk for suicide. Talking to patients about this will not increase the risk of suicide attempt. On the contrary – depressed people are often anxious and ambivalent about suicide and feel relieved when able to talk about it.

If major symptoms have not resolved at all after a month at a normally-effective dose, refer the patient to a psychiatrist, if possible; if not, try a different antidepressant2[b].

The treatment should always be stopped gradually (over a 2-week period for SRis, and a 4-week period for tricyclics). Inform the patient about problems associated with abrupt treatment discontinuation (very common with paroxetine).

[b] In case of treatment failure with an SRI: if the patient is under paroxetine, reduce the dose over a two-week period to avoid withdrawal symptoms, then wait 2 to 4 days before starting the tricyclic antidepressant. If the patient is under fluoxetine, stop fluoxetine (withdrawal symptoms are unlikely) and wait at least 10 to 14 days before starting the tricyclic antidepressant.

Psychotic disorders

Psychoses are characterised by delusions. The patient is convinced of things that are not real, based on intuition, interpretation or hallucinations – especially auditory ones.
Delusions are often accompanied by behaviour disorders, for example agitation, prostration, mutism, opposition, and fleeing.

Management includes psychosocial support and antipsychotic medication.
Treatment efficacy and the prognosis depend in large part on the quality of the relationship established with the patient and his family.
Keeping the patient at home with outpatient follow-up is preferred if the patient is not a danger to himself or others, and if the family is capable of managing the disorder.

The meaning of psychoses varies with the cultural context[a]. For example, psychotic disorders may be attributed to charms or to ancestor intervention. Therapeutic approach should take those beliefs into account. Patient are usually already under "traditional" treatments, this should not be seen as an obstacle to conventional medical treatment.

Acute psychotic episode

An acute psychotic episode can be a one-time occurrence, usually of sudden onset, or can occur repeatedly or may be the early phase of chronic psychosis. It can occur following a life event (e.g., loss, acute stress or trauma). In postpartum psychosis, the delusions centre on the mother-child relationship.

Before prescribing antipsychotic medication, consider the possibility of an underlying organic cause (see Mental confusion) or use of toxic substances.

Antipsychotic therapy is the same as that for chronic psychoses (risperidone or haloperidol, see following page) and should last at least 3 months. After 3 months, if the patient is stable, stop the treatment gradually over 4 weeks, monitoring for potential relapse.

For severe anxiety or agitation, an short-course anxiolytic or sedative treatment (see page 321) may be added to the antipsychotic treatment, at the beginning of treatment.

Chronic psychoses

The chronic psychoses (schizophrenia, paranoid psychosis, etc.) are defined by specific clinical characteristics and their long-term nature.
In schizophrenia, delusions are accompanied by dissociation; the patient seems odd, his speech and thoughts are incoherent, his behaviour unpredictable and his emotional expression discordant. Such patients are often very anxious. Delusions of persecution are common.

[a] Hence the importance of working with an "informant" (in the anthropological sense of the word) when dealing with unfamiliar cultural contexts.

The goal of the treatment is to reduce psychological suffering and disabling symptoms, particularly on the relational level. It offers real benefits, even if chronic symptoms persist (tendency toward social isolation, possible relapses and periods of increased behavioural problems, etc.).

The treatment should last at least one year, with a gradual dose reduction. Low dose may be maintained for longer periods if necessary.

Uncertainty about the possibility of follow-up at one year or beyond is no reason not to treat. However, it is better not to start pharmacological treatment for patients who have no family/social support (e.g., homeless), provided they do not have severe behavioural disorders.

Start treatment at a low dose:
risperidone PO: 2 mg in 2 divided doses on D1, then 4 mg/day in 2 divided doses as of D2. If insufficient, increase to 6 mg/day (8 mg/day maximum).
or
haloperidol PO[b]: 5 mg/day in 2 divided doses; if insufficient, 10 mg/day in 2 divided doses. Not to exceed 20 mg/day.

Antipsychotic therapy

	Risperidone (mg/day)				Haloperidol (mg/day)			
Week/month	**D1**	**W1-W2**	**W3**	**M1**	**W1**	**W2**	**W3**	**M1**
Adults	2	4	4 to 6	4 to 6	5	5	5 to 10	5 to 15
> 60 years	1	2	2 to 4	2 to 4	2	2	2 to 5	2 to 10
Increase only if necessary.								
Breastfeeding	Can be used.				Avoid; if absolutely necessary, administer less than 5 mg/day.			
Pregnancy	Monitor the newborn for the first few days of life.				Monitor the newborn for the first few days of life if the mother received high doses during the 3rd trimester.			

In elderly patients, reduce the dose by half, whichever medication is used.

Extrapyramidal effects, which are more common with haloperidol than with risperidone, can be counteracted by adding **biperiden** PO: 2 to 4 mg/day in 2 divided doses.

Psychoses (first acute episode or decompensation of a chronic psychosis) are much less common during pregnancy than postpartum. In the event of pregnancy in a woman taking antipsychotics, re-evaluate the need to continue the treatment. If treatment is still necessary, refer to the table above. Monitor the newborn for extrapyramidal symptoms during the first few days of life.
For postpartum psychosis, if the woman is breastfeeding, risperidone should be preferred to haloperidol.

[b] If available **haloperidol decanoate** IM (long-acting form) can be used in the long-term treatment of psychoses in patients stabilised on oral therapy (100 mg every 4 weeks).

For severe anxiety or agitation, the following can be added, for a short period, at the beginning of the antipsychotic treatment:

– An anxiolytic, if the patient is anxious:
  diazepam PO: 5 to 15 mg/day in 2 or 3 divided doses for a few days
  Only use the injectable form in severe anxiety (**diazepam** IM: 10 mg, to be repeated once after one or two hours, if necessary), then change to diazepam PO as above.
– Another, more sedating, antipsychotic if the patient is agitated:
  chlorpromazine PO: 75 to 150 mg/day in 3 divided doses for a few days
– For very severe agitation, violence or opposition:
  haloperidol + **chlorpromazine** IM: 25 mg, to be repeated once after one or two hours, if necessary.
  In such cases, continue with haloperidol PO rather than risperidone (and if necessary, continue chlorpromazine PO as above for a few days).

Bipolar disorder

Bipolar disorder is characterised by alternating manic and depressive episodes[c], generally separated by "normal" periods lasting several months or years.

Manic episodes are characterised by elation, euphoria and hyperactivity accompanied by insomnia, grandiose ideas, and loss of social inhibitions (sexual, in particular).
Depressive episodes are often severe, with significant risk of suicide.

Pharmacologically:
– Manic episodes are treated with **risperidone** PO: start at a low dose of 2 mg once daily; increase if necessary in steps of 1 mg/day (maximum dose 6 mg/day) for 3 to 6 weeks. The medication should be stopped gradually, monitoring for possible relapse.
– Depressive episodes are treated as depression (see Depression).
– The primary treatment for bipolar disorder is a long-term mood stabiliser (lithium or carbamazepine).

[c] "Unipolar forms" are characterized by recurring episodes of depression.

Chapter 12: Other conditions

Sickle cell disease

Hypertension

Heart failure in adults

Endemic goitre and iodine deficiency

Sickle cell disease

– Homozygous sickle cell disease (SCD) is a life-threatening genetic disorder of haemoglobin (Hb). The abnormal Hb (HbS) results in the distortion of red blood cells into a sickle shape leading to increased destruction (haemolysis), an increase in blood viscosity and obstruction of capillaries (vaso-occlusion).
– SCD is common in sub-Saharan Africa (1 to 3% of births), on the American continent, in India and in the Mediterranean basin.

Clinical features

– Symptoms generally begin after 6 months of age.
– Major signs: recurrent painful crises, chronic anaemia, splenomegaly and frequently, growth retardation and malnutrition in children.
– Serious acute life threatening complications such as stroke, overwhelming infections and acute chest syndrome.
– In populations in whom the disease is frequent, diagnosis is suggested by a family history of similar clinical signs.

Major acute manifestations

Painful vaso-occlusive crises (VOC)

– Children under 2 years present with the hand-foot syndrome or dactylitis (acute pain and swelling in the hands or feet).
– Children older than 2 years and adults present with acute pain affecting the back, chest, abdomen (can resemble an acute abdomen) and extremities.
– Young children may have non-specific signs of a VOC: refusal to walk, irritability, lack of appetite, crying, whimpering or moaning when touched, etc.
– Look for an associated infection that might have precipitated the VOC.
– In case of bony pain in a single location, unresponsive to analgesics (or a persistent limp in a child) associated with fever and erythema or swelling, consider an osteomyelitis.

Fever

Look for infection: in particular pneumonia, cellulitis, meningitis, osteomyelitis and sepsis (patients are particularly susceptible to infections especially due to pneumococcus, meningococcus and *Haemophilus influenzae*); malaria.

Acute severe anaemia

– The chronic anaemia is often complicated by acute severe anaemia with gradually appearing fatigue, pallor of the conjunctivae and palms, shortness of breath, tachycardia, syncope or heart failure.
– The acute anaemia can be due to:
  • Acute severe haemolysis often secondary to malaria: fever, haemoglobinuria (dark urine) and yellow conjunctivae.
  • Splenic sequestration (trapping of blood cells in the spleen), mostly in children 1 to 4 years: sudden enlargement of the spleen, severe left upper quadrant pain, thrombocytopenia. Can lead to shock.

- Aplastic crisis (transient suspension of red blood cell production by the bone marrow): impalpable spleen and absence of reticulocytes.

Stroke

– Most often ischaemic (due to vaso-occlusion in cerebral vessels) but a stroke can also be haemorrhagic.
– Sudden loss of motor function or aphasia, in children and in adults.
– Signs can resemble meningitis and cerebral malaria: headache, photophobia, vomiting, stiff neck, alteration of consciousness and neurologic signs or rarely seizures.

Acute chest syndrome (ACS)

– Chest pain, tachypnoea, respiratory distress, hypoxia; fever (more frequent in children); pulmonary infiltrate on chest x-ray. Often proceeded by a VOC.
– Complications: multiorgan failure (lung, liver, kidney).

Priapism

Painful prolonged erection in the absence of sexual stimulation, also occurring in young boys. Risk of necrosis and irreversible erectile dysfunction.

Laboratory and other examinations

Diagnosis

– Hb electrophoresis confirms the diagnosis but is often unavailable.
– If not available, a positive Emmel test (or sickling test) in the presence of clinical signs of sickle cell disease supports the diagnosis.

Other examinations

Tests	Indications
Haemoglobin	• At the time of diagnosis and annually (frequently 7 to 9 g/dl). • In case of VOC, fever, acute anaemia (≤ 5 g/dl or drop in Hb ≥ 2 g/dl below the patient's baseline), stroke, ACS. • For monitoring of transfused patients.
Platelets	• At the time of diagnosis and annually. • In case of acute anaemia (thrombocytopenia - platelet count ≤ 100 000/mm^3 if splenic sequestration).
Urine dipstick	• Look for a urinary tract infection in case of fever. • Look for haemoglobinuria in case of acute severe anaemia.
Malaria test	In case of VOC, fever, acute anaemia or stroke.
Lumbar puncture	In case of fever with meningeal signs or unexplained coma.
Other (if available)	• Complete blood count and reticulocyte count. • Blood culture in case of fever. • X-Ray if suspicion of pneumonia, osteomyelitis, ACS.

Management of major acute manifestations

Painful vaso-occlusive crisis (VOC)

– Moderate pain (at home):
  • Generous oral hydration (water, soup, juice, coconut water): minimum 100 ml/kg/day in children and 50 ml/kg/day in adults (2.5 to 3 litres/day);
  • Warm compresses (application of cold is contra-indicated);
  • Level 1 (paracetamol and ibuprofen) and level 2 (tramadol) analgesics;
  • If pain is not controlled at home within 24 hours, seek medical attention.
– Severe pain or pain not controlled at home (in hospital):
  • IV hydration (Appendix 1b) and PO; monitor for fluid overload, discontinue IV fluids progressively after 24 to 48 hours;
  • Level 3 analgesics (morphine);
  • Do not give routine antibiotics in the absence of fever; do not transfuse for VOC.

For the treatment of pain according to intensity, see Pain (Chapter 1).

Fever and infection

– Admit to hospital:
  • All children less than 2 years;
  • In case of fever ≥ 38.5°C in children and ≥ 39.5°C in adults; patients who are critically ill appearing[a] or have acute anaemia.
– PO or IV hydration (Appendix 1a).
– Treat malaria if present.
– Treat bacterial infections according to cause.
– Treat all patients with respiratory symptoms for pneumonia and ACS.
– In case of osteomyelitis:
  ceftriaxone slow IV[b] injection (3 minutes) or IV infusion (30 minutes)
  Children < 40 kg: 100 mg/kg/day in 2 divided doses
  Children ≥ 40 kg and adults: 4 g/day in 2 divided doses
  + **cloxacillin** IV infusion (60 minutes)[c]
  Children < 40 kg: 200 mg/kg/day in 4 divided doses
  Children ≥ 40 kg and adults: 12 g/day in 4 divided doses
  Administer IV therapy for at least 14 days. Then if the patient has improved, change to the oral route for an additional 14 days of treatment with a combination of:
  ciprofloxacin PO
  Children < 35 kg: 30 mg/kg/day in 2 divided doses
  Children ≥ 35 kg and adults: 1 g/day in 2 divided doses
  + **amoxicillin/clavulanic acid** PO (see next page)
– If the source of infection is unknown:
  ceftriaxone IM or slow IV[b] injection (3 minutes) or IV infusion (30 minutes)
  Children < 20 kg: 50 mg/kg once daily (max. 2 g/day)
  Children ≥ 20 kg and adults: 1 to 2 g once daily

[a] Critically ill appearing child: weak grunting or crying, drowsy and difficult to arouse, does not smile, disconjugate or anxious gaze, pallor or cyanosis, general hypotonia.

[b] For administration by IV route, ceftriaxone powder should to be reconstituted in water for injection only. For administration by IV infusion, dilute each dose of ceftriaxone in 5 ml/kg of 0.9% sodium chloride or 5% glucose in children less than 20 kg and in a bag of 100 ml of 0.9% sodium chloride or 5% glucose in children over 20 kg and in adults.

[c] Cloxacillin powder for injection should be reconstituted in 4 ml of water for injection. Then dilute each dose of cloxacillin in 5 ml/kg of 0.9% sodium chloride or 5% glucose in children less than 20 kg and in a bag of 100 ml of 0.9% sodium chloride or 5% glucose in children over 20 kg and in adults.

After 48 hours re-evaluate the patient:

- If the patient is improving (afebrile, can drink), change to:
  amoxicillin/clavulanic acid (**co-amoxiclav**) PO for 7 to 10 days. The dose is expressed in amoxicillin:
  Children < 40 kg: 80 to 100 mg/kg/day in 2 or 3 divided doses (use formulations in a ratio of 8:1 or 7:1 exclusively[d])
  Children ≥ 40 kg and adults:
  Ratio 8:1: 3000 mg/day (= 2 tab of 500/62.5 mg 3 times per day)
  Ratio 7:1: 2625 mg/day (= 1 tab of 875/125 mg 3 times per day)
  Patients over 2 years without acute anaemia can continue treatment as outpatients. Patients under 2 years or with acute anaemia or who cannot be monitored and treated at home by their family should complete PO antibiotic therapy in hospital.
- If the patient is not improving, continue ceftriaxone until the patient is afebrile, then, change to PO treatment. Monitor for acute anaemia.

Acute severe haemolysis (in hospital)

– Treat malaria if present.
– Transfuse packed red blood cells[e,f] if Hb < 5 g/dl or drop of 2 g/dl below the patient's baseline. Target a Hb level of 9 g/dl.
  - Start with 10 to 15 ml/kg in 3 to 4 hours. For information, 10 ml/kg of packed red blood cells usually raise the Hb by 2.5 g/dl.
  - Repeat the Hb. If a 2nd transfusion is needed, check for signs of fluid overload before starting the transfusion.
  - Measure Hb and perform urine dipstick in the following days. Further transfusions may be necessary if haemolysis is ongoing.

Aplastic crisis (in hospital)

– Treat an associated bacterial infection if present.
– Transfuse as for haemolysis. Repeat the Hb every other day. An increasing reticulocyte count and a gradual increase of the Hb indicate improvement. Follow patient until they have reached their baseline Hb.

Splenic sequestration (in hospital)

– Treat hypovolaemic shock if present.
– Monitor the size of the spleen.
– Transfuse if Hb < 5 g/dl, target a Hb level of 7 to 8 g/dl maximum.
– Administer ceftriaxone as above.
– After clinical improvement, monitor for relapse (follow the size of the spleen).

Note: splenectomy is contra-indicated (high operative mortality).

Stroke (in hospital)

– The treatment of choice for ischaemic stroke is an exchange transfusion to lower the concentration of HbS. Transfer the patient to a specialized facility for further management (including prophylactic therapy to prevent recurrences with transfusion program, hydroxyurea).
– If the patient is awaiting transfer or if transfer is not possible:
  - Oxygen continuously, at least 5 litres/minute or to maintain the O_2 saturation (SaO_2) between 94 and 98%.
  - Treat seizures if present.
  - Transfuse if the Hb ≤ 9 g/dl. Target Hb of 10 g/dl.
  - After the transfusion provide IV hydration (Appendix 1a).

[d] If the only formulation of co-amoxiclav available is 4:1, the dose is 50 mg/kg/day.
[e] Always inquire how many transfusions a patient has previously received (risk of iron overload).
[f] Do not transfuse whole blood if possible (risk of fluid overload).

Acute chest syndrome (in hospital)

– Measure SaO_2 and administer oxygen as in stroke.
– IV hydration (Appendix 1a) while monitoring for fluid overload.
– Antibiotics:
ceftriaxone slow IV[g] injection (3 minutes) or IV infusion (30 minutes) for 7 to 10 days
Children < 20 kg: 50 mg/kg once daily (max. 2 g/day)
Children ≥ 20 kg and adults: 1 to 2 g once daily
+ **azithromycin** PO[h] for 5 days
Children: 10 mg/kg once daily (max. 500 mg/day)
Adults: 500 mg on D1 then 250 mg from D2 to D5
– Transfuse if symptoms are unresponsive to antibiotics and Hb < 9 g/dl.
– If wheezing is present treat with:
salbutamol aerosol (100 micrograms/puff)
Children and adults: 2 to 4 puffs with a spacer every 10 to 30 minutes as needed
– Encourage deep breathing (incentive spirometry hourly).
– Treat pain (see Pain, Chapter 1).

Priapism

– PO and IV hydration (Appendix 1b), encourage urination, apply warm compresses, treat pain.
– Erection > 4 hours: consider transfusion and refer to surgery.

Prevention of complications

Certain complications can be avoided with appropriate health education of patients/families, routine preventive care and regular follow-up.

Education of patients (including children) and families

Basic knowledge	
• Disease	Chronic, necessarily transmitted by both parents, non-contagious.
• Treatment	Routine (next page) and symptomatic (pain).
• Monitoring	Size of the spleen, temperature, baseline Hb.
Major precipitating factors of a painful crisis and how to prevent them	
• Cold	Wear warm clothing, avoid bathing in cold water.
• Excessive heat	For example, avoid going out at mid-day.
• Tight clothing	Wear wide comfortable clothing without elastics.
• Dehydration	Drink plenty of fluids.
• Excessive effort	Moderate physical activity is beneficial.
• Infections	Follow routine treatments (including vaccination).
Principal complications requiring the patient to seek urgent medical advice	
• Pain unresponsive to analgesia after 24 hours or severe from the start.	
• Any fever (do not treat at home).	
• Respiratory problems (cough, difficulty breathing, chest pain).	
• Diarrhoea/vomiting and inability to drink.	
• Dehydration (dark, infrequent urine).	
• Anaemia (pale or yellow conjunctivae, pale palms, enlarged spleen).	

[g] For administration by IV route, ceftriaxone powder should to be reconstituted in water for injection only. For administration by IV infusion, dilute each dose of ceftriaxone in 5 ml/kg of 0.9% sodium chloride or 5% glucose in children less than 20 kg and in a bag of 100 ml of 0.9% sodium chloride or 5% glucose in children over 20 kg and in adults.

[h] If azithromycin is not available, **erythromycin** PO for 10 to 14 days: children: 30 to 50 mg/kg/day in 2 or 3 divided doses; adults: 2 to 3 g/day in 2 or 3 divided doses

Routine preventive care

– Prevention of pneumococcal infections
phenoxymethylpenicillin (**penicillin V**) PO until age 15 years (imperatively until 5 years):
Children < 1 year: 125 mg/day in 2 divided doses
Children 1 to < 5 years: 250 mg/day in 2 divided doses
Children 5 to 15 years: 500 mg/day in 2 divided doses

– Immunization
Ensure that the child's immunisations are up to date; if not, administer catch up vaccines:

Children < 5 Years	• Hepatitis B, polio, DTP, measles, *H. influenzae* type B (3 doses) • Pneumococcal conjugate vaccine, PCV13, or if unavailable PCV7 (3 to 4 doses) • Meningococcal conjugate vaccine in endemic areas • At 2 years: pneumococcal 23-valent polysaccharide vaccine, at least 8 weeks after the last PCV13 or PCV7
Children > 5 years	• Hepatitis B, polio, DT or Td according to age, measles, *H. influenzae* type B (1 dose) • Pneumococcal conjugate vaccine PCV13 or PCV7 (3 to 4 doses) • Meningococcal conjugate vaccine in endemic areas

– To support red blood cell production
folic acid PO[i] (life-long treatment)
Children < 1 year: 2.5 mg once daily
Children ≥ 1 year and adults: 5 mg once daily

– Malaria chemoprophylaxis (if malaria prevalence ≥ 5%)
mefloquine PO
Children 6 months to 5 years and > 5 kg: 5 mg base/kg once weekly
Do not use to treat malaria.

– Provide nutritional support at hospital discharge.

Routine follow-up of patients

– Between crises, for information:
  • Children under 5 years: every 1 to 3 months;
  • Children over 5 years: every 3 to 6 months.

– After a crisis: as often as necessary, according to the clinical course.

[i] Iron is contraindicated in patients who have received multiple transfusions. Avoid combined preparations of iron and folic acid.

Hypertension

– *Adult essential hypertension* is defined as a systolic pressure greater than or equal to 160 mmHg and/or a diastolic pressure greater than or equal to 90 mmHg.
The elevation must be constant: blood pressure must be measured twice at rest during three consecutive consultations over a period of three months.
Hypertension is a risk factor for stroke (cerebrovascular accident or CVA), heart failure, renal failure and atherosclerosis.

– *Hypertension in pregnancy* is defined as a systolic pressure greater than or equal to 140 mmHg or a diastolic pressure greater than or equal to 90 mmHg (with the patient seated and at rest). It may be isolated or associated with proteinuria or oedema in the case of pre-eclampsia.
Hypertension in pregnancy is a risk factor for eclampsia, placental abruption and premature delivery.

Treatment of adult essential hypertension

– In patients with medication-induced hypertension (oral contraceptives, hydrocortisone, MAO inhibitors, NSAID etc.), stop or change the treatment.
– Otherwise, start with diet and exercise modification: reduce salt intake, lose any excess weight, and increase the level of physical activity.
– If despite these measures the blood pressure remains consistently above 160/100 mmHg (or 140/80 mmHg for a diabetic patient or following a CVA), an anti-hypertensive medication may be added.
– Start with monotherapy. The optimal dose depends on the patient; reduce by half the initial dose for elderly patients.
– The three classes of anti-hypertensives used as initial therapy[a] are the thiazide diuretics, the beta-blockers and the angiotensin converting enzyme (ACE) inhibitors. For information:

Indications	Initial treatment
Uncomplicated hypertension	thiazide diuretic or beta-blocker
Patient over 65 years	thiazide diuretic
Diabetic patient	thiazide diuretic
Complicated hypertension:	
Following a CVA	thiazide diuretic
Following a myocardial infarction	beta-blocker
Heart failure	ACE inhibitor
Renal failure	ACE inhibitor

– The treatment must be taken regularly. Abrupt cessation of beta-blocker treatment may cause adverse effects (malaise, angina)[b]. Only prescribe a treatment if it can be followed by a patient under regular surveillance.

[a] The diuretics, beta-blockers, and ACE inhibitors have shown their capacity to prevent the complications of hypertension. They are preferred to other anti-hypertensives, notably calcium channel blockers (nifedipine).

[b] Furthermore, a sudden stop to treatment with centrally acting anti-hypertensives (e.g. methyldopa, clonidine) may cause a rebound effect.

The objective is to reduce the blood pressure to below 160/90 mmHg (or 140/90 mmHg for diabetic patients) while producing the fewest possible adverse effects.
For uncomplicated hypertension:
- Start with a thiazide diuretic: **hydrochlorothiazide** PO, 25 to 50 mg once daily.
- If the patient is not improving after 4 weeks, or if treatment is not tolerated: check compliance, and then if there are no contra-indications (asthma, uncontrolled heart failure), change to a beta-blocker: **atenolol** PO, 50 to 100 mg once daily.
- If the treatment is still of little or no benefit: recheck compliance, and then consider combined therapy (thiazide diuretic + beta-blocker or thiazide diuretic + ACE inhibitor).

Note: if **enalapril**[c] is used as monotherapy (see table of indications), start with 5 mg once daily, then increase the dose every 1 to 2 weeks, according to blood pressure, up to 10 to 40 mg once daily or in 2 divided doses. In elderly patients, patients taking a diuretic or patients with renal impairment: start with 2.5 mg once daily as there is a risk of hypotension and/or acute renal impairment.

Specific case: treatment of hypertensive crisis

An occasional rise in blood pressure usually passes without problems, whereas aggressive treatment, notably with sublingual nifedipine, can have serious consequences (syncope, or myocardial, cerebral, or renal ischaemia).

– In patients with hypertensive crisis:
  - Reassure the patient and place him at rest.
  - If despite these measures the blood pressure remains elevated, the addition of **furosemide** PO (20 mg once daily) may, in certain cases, gradually reduce the blood pressure in 24 to 48 hours and prevent eventual complications.
– In patients with hypertensive crisis complicated by acute pulmonary oedema:
  - The objective is not to normalise the blood pressure at any price, but to treat the pulmonary oedema (see Acute heart failure).
  - Start or adjust the baseline treatment once the crisis is resolved.

Treatment of HTA in pregnancy and pre-eclampsia

Assess regularly: BP, weight, oedema, proteinuria, and uterine height.

For isolated hypertension (without proteinuria)

– Rest and observation, normal sodium and caloric intake.
– Antihypertensive treatment if the systolic BP is ≥ 160 mmHg or the diastolic BP is ≥ 110 mmHg:
  methyldopa PO: 500 to 750 mg/day in 2 to 3 divided doses for 2 days then increase gradually by 250 mg increments every 2 to 3 days, up to the usual dose of 1.5 g/day. Do not exceed 3 g/day.
  or
  labetalol PO: 200 mg/day in 2 divided doses then increase by 100 to 200 mg increments up to the usual dose of 400 to 800 mg/day. If higher daily doses are required, administer in 3 divided doses. Do not exceed 2.4 g/day.
  Do not stop treatment abruptly, reduce doses gradually.
  Diuretics and angiotensin converting enzyme inhibitors are contra-indicated in the treatment of hypertension in pregnancy.

[c] **Enalapril** (10 to 40 mg once daily or in 2 divided doses) may be replaced by captopril (100 mg/day in 2 divided doses).

For moderate pre-eclampsia (hypertension + proteinuria)

– Rest and observation, normal sodium and caloric intake.
– Antihypertensive treatment if the systolic BP is ≥ 160 mmHg or the diastolic BP is ≥ 110 mmHg, as above.
– After 37 weeks, if there is a true intrauterine growth retardation: delivery, vaginally or by caesarean section depending on the cervical assessment. If there is no clear growth retardation, induce delivery as soon as the cervix is favourable.

For severe pre-eclampsia (hypertension + massive proteinuria + major oedema)

– Refer to a surgical centre for urgent delivery within 24 hours, vaginally or by caesarean section depending on the cervical assessment and the foetus condition.
– While waiting for delivery, observation, normal sodium and caloric intake.
– Antihypertensive treatment if the systolic BP is ≥ 160 mmHg or the diastolic BP is ≥ 110 mmHg, as above. If the treatment cannot be administered by oral route, use:

  hydralazine by IV infusion:
  Dilute 100 mg (5 vials of hydralazine, 5 ml) in 500 ml of 0.9% sodium chloride or Ringer lactate, to obtain a solution containing 200 micrograms/ml.
  Initial dose: 200 to 300 micrograms/minute; maintenance dose: 50 to 150 micrograms/minute.
  Administer by increasing the rate up to 20 drops/minute (max. 30 drops/minute), check BP every 5 minutes.
  As soon as hypertension is controlled, decrease progressively the rate (15 drops/ minute, then 10, then 5) until stopping infusion. An abrupt discontinuation may provoke a hypertensive crisis.

  or **hydralazine** by slow, diluted IV injection:
  Dilute 20 mg (1 vial hydralazine, 1 ml) in 9 ml of 0.9% sodium chloride to obtain a solution containing 2 mg/ml.
  Administer 5 mg (2.5 ml of the diluted solution) over 2 to 4 minutes. Check BP for 20 minutes. If BP is not controlled after 20 minutes, administer the same dose. Continue repeating if necessary, waiting 20 minutes between each injection, without exceeding a cumulative dose of 20 mg.

  or **labetalol** (100 mg in 20 ml ampoule, 5 mg/ml) slow IV:
  One dose of 20 mg (4 ml) over at least one minute. Check BP 5 and 10 minutes after injection. If BP is not controlled, administer another dose of 20 mg and check BP. Additional doses of 40 mg then 80 mg may be administered every 10 minutes until BP is controlled. Do not exceed a cumulative dose of 300 mg.

  Do not exceed recommended doses and administration rate. During administration, monitor maternal BP and pulse, as well as foetal heart rate. An overdose or too rapid administration may provoke an abrupt fall in maternal BP with placental hypoperfusion and foetal death.
  Diastolic BP must never fall below 90 mmHg. In the event of hypotension, use Ringer Lactate to maintain the diastolic BP ≥ 90 mmHg.
– To reduce the risk of eclampsia prior to delivery:
  Magnesium sulfate (see Seizures, page 23, Chapter 1). Continue for 24 hours following delivery.

For eclampsia

– Urgent delivery within 12 hours, vaginally or by caesarean section depending on the cervical assessment and the foetus condition.
– Antihypertensive treatment if the systolic BP is ≥ 160 mmHg or the diastolic BP is ≥ 110 mmHg, as above.
– Magnesium sulfate (see Seizures, page 23, Chapter 1). Continue for 24 hours following delivery or following the last seizure.
– Nursing, hydration, monitor urinary output (insert a urinary catheter); oxygen (4 to 6 litres/minute).

For more information, refer to the MSF handbook, *Essential obstetric and newborn care*.

Heart failure in adults

Heart failure is defined as the inability of the myocardium to provide normal haemodynamic function.
Left-sided heart failure (often secondary to coronary or valvular heart disease, and/or arterial hypertension) is the most common form.
There are two types:
– chronic heart failure with insidious onset,
– acute heart failure, which is life threatening, presents either as acute pulmonary oedema or as cardiogenic shock.

Clinical features

– *Left-sided heart failure* secondary to left ventricular failure:
  • fatigue and/or progressive dyspnoea, occurs on exertion and then at rest (accentuated by the decubitus position, preventing the patient from lying down);
  • acute pulmonary oedema: acute dyspnoea, laryngeal crackles, cough, frothy sputum, anxiety, pallor, varied degrees of cyanosis, feeble rapid pulse, wet rales in both lung fields, muffled heart sounds, often with cardiac gallop.
– *Right-sided heart failure* secondary to right ventricular failure:
  • oedema of the lower limbs, jugular venous distention, hepatomegaly, hepatojugular reflux;
  • ascites in advanced stages.
  Rarely isolated, this is often a consequence of left ventricular failure.
– *Global heart failure* secondary to failure of both ventricles:
  • left and right-sided signs. Signs of right ventricular failure are often the most prominent.

Treatment of acute heart failure (acute pulmonary oedema and cardiogenic shock)

First case: blood pressure is maintained

– Place the patient in the semi-reclined position with legs lowered.
– Give high-flow oxygen
– Reduce pulmonary pressure with combination furosemide + morphine + rapidly-acting nitrate derivatives:
  furosemide IV (onset of action in 5 minutes and peak effect in 30 minutes):
  40 to 80 mg/injection, to be repeated every 2 hours according to clinical evolution; monitor blood pressure and urine output
  + **morphine**: according to severity 3 to 5 mg by slow IV injection or 5 to 10 mg by SC injection
  + **glyceryl trinitrate** sublingual: 0.25 to 0.5 mg. Monitor blood pressure. Repeat after 30 minutes if necessary, only if the systolic blood pressure remains above 100 mmHg.
– In certain serious cases, if none of these drugs are available, bleed off 300 to 500 ml of blood over 5 to 10 minutes from the basilic vein (in the elbow fold) and monitor the blood pressure.

Second case: blood pressure collapsed

See Cardiogenic shock, page 19, Chapter 1.

Treatment of chronic heart failure

The objective is to improve the prognosis and quality of life.

Dietary modification

Reduce salt intake to limit fluid retention, normal fluid intake (except in the case of anasarca: 750 ml/24 hours).

Treatment of fluid retention

- Initial therapy: **furosemide** PO
  During congestive episodes: 40 to 120 mg once daily. When the congestive episode is controlled, reduce the dose to 20 mg once daily.
- The dose can be increased (up to 240 mg/day). If these doses are still ineffective, adding **hydrochlorothiazide** PO (25 to 50 mg/day for several days) may be considered.
- In case of treatment failure and in the absence of severe renal impairment, furosemide may be combined with **spironolactone** PO: 25 mg once daily.
- If present, drainage of pleural effusions by needle aspiration.

Note: the risks of administering diuretics include: dehydration, hypotension, hypo- or hyperkalaemia, hyponatremia, and renal impairment. Clinical monitoring (hydration, blood pressure) and if possible metabolic monitoring (serum electrolytes and creatinine), should be done regularly, especially if giving high doses or in elderly patients.

Baseline treatment

- Angiotensin converting enzyme (ACE) inhibitors are the first line treatment. Start with low doses, especially in patients with low blood pressure, renal impairment, hyponatremia, or concurrent diuretic treatment.
  enalapril PO: 2.5 mg once daily for the first week, then double the dose each week until the effective dose is reached, usually around 10 to 20 mg once daily or in 2 divided doses (max. 40 mg/day). Increases in the dose are made while monitoring the patient's blood pressure (the systolic pressure should remain above 90 mmHg) and blood chemistry (there is a risk of hyperkalemia[a] and renal impairment).

  In patients treated with diuretics, reduce the dose of the diuretic if possible while introducing ACE inhibitors.
  If the patient is taking high doses of diuretics, reduce the initial dose of enalapril to half (risk of symptomatic hypotension).
  Do not combine ACE inhibitors and spironolactone (risk of severe hyperkalemia).
- If the patient has stabilised with enalapril, introduce **bisoprolol** PO if possible: start with 1.25 mg/day and increase according to the table below, as long as the drug is well tolerated (monitor cardiac frequency, blood pressure, signs of worsening heart failure).

Weeks	Daily dose
Week 1	1.25 mg once daily
Week 2	2.5 mg once daily
Week 3	3.75 mg once daily
Week 4 to 8	5 mg once daily
Week 9 to 12	7.5 mg once daily
From Week 13	10 mg once daily (max. 10 mg/day)

[a] Moderate hyperkalaemia is frequent, but of no concern if it remains below 5.5 mEq/l.

– Digitalis glycosides are only indicated in patients with proven atrial fibrillation (ECG).
If there are no contra-indications (bradycardia, unidentified rhythm disturbances):
digoxin PO: 0.5 to 1 mg in 3 or 4 divided doses on the first day, then 0.25 mg once daily
The therapeutic dose is close to the toxic dose. Do not exceed the indicated dose and give half the dose, or even a quarter (on alternate days) to elderly or malnourished patients and to patients with renal impairment.

– With global and left-sided heart failure, the nitrate derivatives may be used in case of signs of intolerance to ACE inhibitors (chronic cough, renal impairment, severe hypotension).
isosorbide dinitrate PO: start with 10 to 15 mg/day in 2 or 3 divided doses and increase to the effective dose, usually around 15 to 60 mg/day. Very high doses (up to 240 mg/day) may be necessary.

– Whatever the treatment prescribed, monitoring should be regular: checking clinical improvement and treatment tolerance:
  • clinical monitoring consists of evaluating the weight, blood pressure, pulse (rhythm disturbances) and the progress of signs (dyspnoea, oedema, etc.);
  • laboratory monitoring is adapted according to the treatment.

Treatment of specific aetiologies

See Hypertension and Anaemia (Chapter 1).

Cardiovascular or "wet" beriberi from vitamin B1 deficiency

thiamine IM or IV
Children: 25 to 50 mg/day for several days
Adults: 50 to 100 mg/day for several days

Then change to oral treatment with **thiamine** PO
Children and adults: 3 to 5 mg once daily for 4 to 6 weeks

Acute rheumatic fever

– Primary prophylaxis
benzathine benzylpenicillin IM
Children under 30 kg: 600 000 IU as a single dose
Children 30 kg and over and adults: 1.2 MIU as a single dose

– Anti-inflammatory treatment
Start with **acetylsalicylic acid** PO: 50 to 100 mg/kg/day
If the fever or cardiac signs persist, replace with a corticosteroid:
prednisolone PO
Children: 1 to 2 mg/kg/day
Adults: 60 to 120 mg/day
Continue this treatment for 2 to 3 weeks after normalisation of the erythrocyte sedimentation rate (ESR), then decrease the doses progressively (over 2 weeks).
To avoid a relapse, resume the acetylsalicylic acid treatment in parallel with the decrease in prednisolone dose. The acetylsalicylic acid treatment is continued for 2 to 3 weeks after the corticosteroids are fully stopped.

– Secondary prophylaxis
Prophylactic treatment lasts for several years (until 18 years old, even until 25 years in the case of cardiac effects; for life in the case of chronic valvular damage).
benzathine benzylpenicillin IM
Children under 30 kg: 600 000 IU, one injection every 4 weeks
Children 30 kg and over and adults: 1.2 MIU, one injection every 4 weeks

Endemic goitre and iodine deficiency

– Goitre is an enlargement of the thyroid gland. Endemic goitre occurs in iodine- deficient areas. Goitre can also be caused or aggravated by the regular consumption of goitrogens such as manioc, cabbage, turnips, millet etc.
– Goitre is an adaptive process: iodine is essential for the production of thyroid hormones; iodine deficiency impairs thyroid hormone synthesis; to compensate, the thyroid gland increases in volume. Thyroid function usually remains normal.
– As well as the development of goitre, iodine deficiency in pregnant women has serious consequences for the child (foetal and perinatal mortality, physical and mental retardation, cretinism). These risks must be prevented by providing iodine supplementation in iodine-deficient areas.

Clinical features

– The WHO proposes a simplified classification based on the significance of goitre:
  Group 0: normal thyroid, no palpable or visible goitre
  Group 1: enlarged thyroid, palpable but not visible when the neck is in the normal position
  Group 2: thyroid clearly visible when the neck is in the normal position
– Possible mechanical complications (rare): compression, deviation of the trachea or of the oesophagus.

Prevention and treatment

The objective of prevention is to reduce the consequences of iodine deficiency in neonates and children. Supplying iodised salt through national programmes is the recommended method of prevention.

For prevention in populations living in iodine deficient areas where iodised salt is not available and for curative treatment of patients with goitre: use **iodised oil**, according to national protocols. For information (according to the WHO):

Population	Oral **iodised oil** as a single yearly dose (190 mg capsule)
Children under 1 year	1 capsule
Children from 1 to < 6 years	2 capsules
Children from 6 to 15 years	3 capsules
Pregnant or lactating women or women of childbearing age	2 capsules

Curative and preventive single-doses are the same. Oral treatment is preferred. The target populations are pregnant and breastfeeding women, women of childbearing age and children.

In children, goitre disappears after several months. It disappears more slowly (or never) in adults despite restoration of normal thyroid function in 2 weeks. Surgery is only indicated for patients with local mechanical dysfunction.

Appendices

1a. Normal daily maintenance IV fluids in children > 1 month

1b. 1.5 x daily maintenance IV fluids in children > 1 month

2. Assessment and treatment of diarrhoea - The interagency emergency health kit Annex 2 (WHO)

3. Practical advice for writing medical certificates in the event of sexual violence

Appendix 1a. Normal daily maintenance IV fluids in children > 1 month

Indications

Basic hydration needs[a] for patients unable to drink sufficiently. After 48 hours, it is essential to provide nutrition to the patient orally or by nasogastric tube and to gradually reduce IV fluids.

⚠ This protocol should not be used for surgical or burns patients, those with renal, cardiac disease or diabetic ketoacidosis.

Fluid to be administered

The fluid of choice in children is *Ringer lactate-Glucose 5% (RL-G5%)*. Use a premixed solution if available. If not, add 50 ml of G50% to 500 ml of RL or 100 ml of G50% to 1000 ml of RL. If RL is not available, use 0.9% sodium chloride instead.

For ease of prescription and administration, the daily volumes and rates in drops per minute have been rounded off.

Weight	Volume/24 hours	Rate* (paediatric infusion set 1 ml = 60 drops)
3 to < 4 kg	350 ml/24 h	16 drops/min
4 to < 5 kg	450 ml/24 h	18 drops/min
5 to < 6 kg	550 ml/24 h	22 drops/min
6 to < 7 kg	650 ml/24 h	26 drops/min
7 to < 8 kg	750 ml/24 h	30 drops/min
8 to < 9 kg	850 ml/24 h	36 drops/min
9 to < 11 kg	950 ml/24 h	40 drops/min
11 to < 14 kg	1100 ml/24 h	46 drops/min
14 to < 16 kg	1200 ml/24 h	50 drops/min
16 to < 18 kg	1300 ml/24 h	54 drops/min
18 to < 20 kg	1400 ml/24 h	58 drops/min

Weight	Volume/24 hours	Rate* (paediatric infusion set 1 ml = 60 drops)	Rate (standard infusion set 1 ml = 20 drops)
20 to < 22 kg	1500 ml/24 h	62 drops/min	20 drops/min
22 to < 26 kg	1600 ml/24 h	66 drops/min	22 drops/min
26 to < 30 kg	1700 ml/24 h	70 drops/min	24 drops/min
30 to < 35 kg	1800 ml/24 h	74 drops/min	26 drops/min
≥ 35 kg	2000 ml/24 h	82 drops/min	28 drops/min

* In a paediatric infusion set, the number of drops per minute is equal to the number of ml per hour. For example: 15 drops/min = 15 ml/hour

[a] Daily needs are calculated according the following formula:
Children 0-10 kg: 100 ml/kg per day
Children 11-20 kg: 1000 ml + (50 ml/kg for every kg over 10 kg) per day
Children > 20 kg: 1500 ml + (20-25 ml/kg for every kg over 20 kg) per day
Adults: 2 litres per day

Appendix 1b. 1.5 x daily maintenance IV fluids in children > 1 month

Indications

Increased hydration (more than maintenance fluids) is indicated in certain exceptional situations such as in sickle cell patients with painful vaso-occlusive crises (unless acute chest syndrome is suspected) and priapism.
Do not administer these volumes for more than 24 hours; encourage early oral hydration and simultaneously, gradually reduce IV fluids. Monitor for signs of fluid overload.

Fluid to be administered

The fluid of choice in children is *Ringer lactate-Glucose 5%*. For preparation, see Appendix 1a.

For ease of prescription and administration, the daily volumes and rates in drops per minute have been rounded off.

1.5 X maintenance fluids		
Weight	**Volume/24 hours**	**Rate** (paediatric infusion set 1 ml = 60 drops)
3 to < 4 kg	550 ml/24 h	22 drops/min
4 to < 5 kg	650 ml/24 h	26 drops/min
5 to < 6 kg	850 ml/24 h	34 drops/min
6 to < 7 kg	950 ml/24 h	40 drops/min
7 to < 8 kg	1100 ml/24 h	46 drops/min
8 to < 9 kg	1250 ml/24 h	52 drops/min
9 to < 11 kg	1450 ml/24 h	60 drops/min
11 to < 14 kg	1650 ml/24 h	68 drops/min
14 to < 16 kg	1800 ml/24 h	76 drops/min
16 to < 18 kg	1950 ml/24 h	82 drops/min
18 to < 20 kg	2100 ml/24 h	86 drops/min

Weight	**Volume/24 hours**	**Rate** (paediatric infusion set 1 ml = 60 drops)	**Rate** (standard infusion set 1 ml = 20 drops)
20 to < 22 kg	2200 ml/24 h	92 drops/min	30 drops/min
22 to < 26 kg	2400 ml/24 h	100 drops/min	34 drops/min
26 to < 30 kg	2600 ml/24 h	108 drops/min	36 drops/min
30 to < 35 kg	2800 ml/24 h	–	38 drops/min
≥ 35 kg	3000 ml/24 h	–	42 drops/min

Annex 2: Assessment and treatment of diarrhoea[53]

A-2.1 Assessment of diarrhoeal patients for dehydration

Table 1: Assessment of diarrhoea patients for dehydration

	A	B	C
1. Look at: Condition[a] Eyes[b] Thirst	 Well, alert Normal Drinks normally, not thirsty	 Restless, irritable Sunken Thirsty, drinks eagerly	 Lethargic or unconscious Sunken Drinks poorly or not able to drink
2. Feel: Skin pinch[c]	Goes back quickly	Goes back slowly	Goes back very slowly
3. Decide:	The patient has **no signs of dehydration**	If the patient has two or more signs in B, there is **some dehydration**	If the patient has two or more signs in C, there is **severe dehydration**
4. Treat:	Use Treatment Plan A	Weigh the patient, if possible, and use Treatment Plan B	Weigh the patient and use Treatment Plan C **Urgently**

[a] Being lethargic and sleepy are *not* the same. A lethargic child is not simply asleep: the child's mental state is dull and the child cannot be fully awakened; the child may appear to be drifting into unconsciousness.
[b] In some infants and children the eyes normally appear somewhat sunken. It is helpful to ask the mother if the child's eyes are normal or more sunken than usual.
[c] The skin pinch is less useful in infants or children with marasmus or kwashiorkor or in obese children.

[53] Department of Child and Adolescent Health and Development. The treatment of diarrhoea - a manual for physicians and other senior health workers. Geneva: World Health Organization; 2005.

A-2.2 Treatment of acute diarrhoea (without blood)

Treatment Plan A: treat diarrhoea at home

Use this plan to teach the mother how to:

- prevent dehydration at home by giving the child more fluid than usual;
- prevent malnutrition by continuing to feed the child, and why these actions are important;
- recognize signs indicating that the child should be taken to a health worker.

The four rules of Treatment Plan A:

Rule 1:
Give the child more fluids than usual, to prevent dehydration

- Use recommended home fluids. These include: ORS solution, salted drinks (e.g. salted rice water or a salted yogurt drink), vegetable or chicken soup with salt.
- Avoid fluids that do not contain salt, such as: plain water, water in which a cereal has been cooked (e.g. unsalted rice water), unsalted soup, yoghurt drinks without salt, green coconut water, weak tea (unsweetened), unsweetened fresh fruit juice. Other fluids to avoid are those with stimulant, diuretic or purgative effects, for example: coffee, some medicinal teas or infusions.
- Be aware of fluids that are potentially dangerous and should be avoided during diarrhoea. Especially important are drinks sweetened with sugar, which can cause osmotic diarrhoea and hypernatraemia. Some examples are: commercial carbonated beverages, commercial fruit juices, sweetened tea.
- Use ORS solution for children as described in the box below. (Note: if the child is under 6 months and not yet taking solid food, give ORS solution or water.)

Give as much as the child or adult wants until diarrhoea stops. Use the amounts shown below for ORS as a guide. Describe and show the amount to be given after each stool is passed, using a local measure.

Age	Amount of ORS to be given after each loose stool	Amount of ORS to provide for use at home
≤ 24 months	50-100 ml	500 ml/day
2 - 10 years	100-200 ml	1L/day
≥10 years	as much as wanted	2L/day

Show the mother how to mix ORS and show her how to give ORS.

- Give a teaspoonful every 1-2 minutes for a child under 2 years.
- Give frequent sips from a cup for older children.

- If the child vomits, wait 10 minutes. Then give the solution more slowly (for example, a spoonful every 2-3 minutes).
- If diarrhoea continues after the ORS packets are used up, tell the mother to give other fluids as described in the first rule above or return for more ORS.

Rule 2:
Give supplemental zinc sulfate 20 mg tab to the child, every day for 10 to 14 days

Zinc sulfate can be given as dispersible tablets. By giving zinc sulfate as soon as diarrhoea starts, the duration and severity of the episode as well as the risk of dehydration will be reduced. By continuing zinc sulfate supplementation for 10 to 14 days, the zinc lost during diarrhoea is fully replaced and the risk of the child having new episodes of diarrhoea in the following 2 to 3 months is reduced.

Rule 3:
Continue to feed the child, to prevent malnutrition

- Breastfeeding should **always** be continued.
- The infant's usual diet should be continued during diarrhoea and increased afterwards;
- Food should **never** be withheld and the child's usual food should not be diluted;
- Most children with watery diarrhoea regain their appetite after dehydration is corrected;
- Milk:
  - **Infants of any age who are breastfed** should be allowed to breast-feed as often and as long as they want. Infants will often breastfeed more than usual, encourage this;
  - **Infants who are not breastfed**, should be given their usual milk feed (formula) at least every three hours, if possible by cup.
  - **Infants below 6 months of age who take breast milk and other foods** should receive increased breastfeeding. As the child recovers and the supply and the supply of breast milk increases, other foods should be decreased.
  - **A child who is at least 6 months old or is already taking soft foods** should be given cereals, vegetables and other foods, in addition to milk. If the child is **over 6 months and such foods are not yet being given**, they should be started during the diarrhoea episode or soon after it stops.
  - Recommended food should be culturally acceptable, readily available. Milk should be mixed with a cereal and if possible, 1 - 2 teaspoonfuls of vegetable oil should be added to each serving of cereal. If available, meat, fish or egg should be given.
  - Foods rich in potassium, such as bananas, green coconut water and fresh fruit juice are beneficial;
    - offer the child food every three or four hours (six times a day);
    - after the diarrhoea stops, continue to give the same energy-rich food, and give one more meal than usual each day for at least two weeks.

Rule 4:
Take the child to a health worker if there are signs of dehydration or other problems

The mother should take her child to a health worker if the child:

- Starts to pass many watery stools
- Vomits repeatedly
- Becomes very thirsty
- Is eating or drinking very poorly
- Develops a fever
- Has blood in the stool; or
- Does not get better in three days-

Treatment Plan B: oral rehydration therapy for children with some dehydration

Table 2:
Guidelines for treating children and adults with some dehydration

Approximate amount of ORS solution to give in the first 4 hours						
Age*	**<4 mths**	**4-11 mths**	**12-23mths**	**2-4 years**	**5-14 years**	**≥15 years**
Weight	< 5 kg	5-7.9 kg	8-10.9 kg	11-15.9 kg	16-29.9 kg	**≥**30 kg
Quantity	200-400 ml	400-600 ml	600-800 ml	800 ml-1.2 L	1.2-2 L	2.2-4 L
In local measure						

Use the patient's age only when you do not know the weight. The approximate amount of ORS required (in ml) can also be calculated by multiplying the patient's weight in kg by 75.

- If the patient wants more ORS than shown, give more.
- Encourage the mother to continue breastfeeding her child.

NOTE: during the initial stages of therapy, while still dehydrated, adults can consume up to 750 ml per hour, if necessary, and children up to 20 ml per kg body weight per hour.

How to give ORS solution

- Teach a family member to prepare and give ORS solution.
- Use a clean spoon or cup to give ORS solution to infants and young children. Feeding bottles should **not** be used.
- Use droppers or syringes to put small amounts of ORS solution into mouths of babies.
- Children under 2 years of age, should get a teaspoonful every 1-2 minutes; older children (and adults) may take frequent sips directly from a cup.
- Check from time to time to see if there are problems.
- If the child vomits, wait 5-10 minutes and then start giving ORS again, but more slowly, for example, a spoonful every 2-3 minutes.

- If the child's eyelids become puffy, stop the ORS and give plain water or breast milk. Give ORS according to Plan A when the puffiness is gone.

Monitoring the progress of oral rehydration therapy

- Check the child frequently during rehydration.
- Ensure that ORS solution is being taken satisfactorily and the signs of dehydration are not worsening.
- After four hours, reassess the child fully following the guidelines in Table 1 and decide what treatment to give.
- If signs of **severe dehydration** have appeared, shift to Treatment Plan C.
- If signs indicating **some dehydration** are still present, repeat Treatment Plan B. At the same time offer food, milk and other fluids as described in Treatment Plan A, and continue to reassess the child frequently.
- If there are **no signs of dehydration**, the child should be considered fully rehydrated. When rehydration is complete:
    - skin pinch is normal;
    - thirst has subsided;
    - urine is passed;
    - child becomes quiet, is no longer irritable and often falls asleep.
- Teach the mother how to treat her child at home with ORS solution and food following Treatment Plan A. Give her enough ORS packets for 2 days.
- Also teach her the signs that mean she should bring her child back to see a health worker.

If oral rehydration therapy must be interrupted

If the mother and child must leave before the rehydration with ORS solution is completed:

- Show her how much ORS to give to finish the 4-hour treatment at home.
- Give her enough ORS packets to complete the four hour treatment and to continue oral rehydration for two more days, as shown in Treatment Plan B.
- Show her how to prepare ORS solution.
- Teach her the four rules in Treatment Plan A for treating her child at home.

When oral rehydration fails

- If signs of dehydration persist or reappear, **refer the child.**

Giving zinc sulfate

- Begin to give supplemental zinc sulfate tablets, as in Treatment Plan A, as soon as the child is able to eat following the initial four hour rehydration period.

Giving food

- Except for breast milk, food should not be given during the initial four-hour rehydration period.

- Children continued on Treatment Plan B longer than four hours should be given some food every 3-4 hours as described in Treatment Plan A.
- **All children** older than 6 months should be given some food before being sent home. This helps to emphasize to mothers the importance of continued feeding during diarrhoea.

Treatment Plan C: for patients with severe dehydration

Follow the arrows. If the answer is "yes" go across. If "no" go down.

Can you give intravenous (IV) fluids immediately?

Yes →

Start IV fluids immediately. If the patient can drink, give ORS by mouth while the drip is set up. Give 100 ml/kg Ringer's Lactate Solution (or if not available normal saline), divided as follows:

Age	First give 30 ml/kg in:	Then give 70 ml/kg in:
Infants (under 12 months)	**1 hour***	**5 hours**
Older	**30 minutes***	**2 ½ hours**

* Repeat once if radial pulse is still very weak or non-detectable.

- Reassess the patient every 1-2 hours. If hydration is not improving, give the IV drip more rapidly.
- Also give ORS (about 5 ml/kg/hour) as soon as the patient can drink: usually after 2-4 hours (infants) or 1-2 hours (older patients).
- After 6 hours (infants) or 3 hours (older patients), evaluate the patient using the assessment chart. Then choose the appropriate Plan (A, B or C) to continue treatment.

No ↓

Is IV treatment available nearby (within 30 minutes)?

Yes →

- Send the patient immediately for IV treatment.
- If the patient can drink, provide the mother with ORS solution and show her how to give it during the trip to receive IV treatment.

No ↓

Are you trained to use a naso-gastric tube (NG) for rehydration?

Yes →

- Start rehydration by tube with ORS solution: give 20 ml/kg/hour for 6 hours (total of 120 ml/kg).
- Reassess the patient every 1-2 hours:
  - if there is repeated vomiting or increased abdominal distension, give the fluid more slowly.
  - if hydration is not improved after 3 hours, send the patient for IV therapy.
- After 6 hours, reassess the patient and choose the appropriate treatment plan.

No ↓

Can the patient drink?

Yes →

- Start rehydration by mouth with ORS solution, giving 20 ml/kg/hour for 6 hours (total of 120 ml/kg).
- Reassess the patient every 1-2 hours:
  - if there is repeated vomiting, give the fluid more slowly - if hydration is not improved after 3 hours send the patient for IV therapy.
- After 6 hours, reassess the patient and choose the appropriate treatment plan.

No ↓

Urgent: send the patient for IV or NG treatment.

NB: If possible, observe the patient for at least six hours after rehydration to be sure the mother can maintain hydration giving ORS solution by mouth. If the patient is over two years old and there is cholera in your area, give an appropriate oral antibiotic after the patient is alert.

Appendix 3. Practical advice for writing medical certificates in the event of sexual violence

Physicians are often the first to be confronted with the consequences of violence. Victims are sometimes afraid to report to the authorities concerned, particularly when the population affected is vulnerable (refugees, prisoners, civilian victims of war etc.). In such a situation, the physician should try to determine if the event was isolated or part of larger scale violence (e.g. systematic rape).

Faced with sexual violence, the physician is obliged to complete a medical certificate for the benefit of the victim, irrespective of the country in which (s)he is practising.
The certificate is *individual* (for the benefit of the individual or their beneficiaries) and *confidential* (it falls within professional confidentiality). The examples of certificates presented in the following pages are written for *sexual violence*, but the approach is the same for *all forms of intentional violence*.

All medical certificates must include:
- The identity of the signing physician.
- The identity of the victim (except for certificates passed on to HCR or to ICRC *without the consent of the victim*, see below).
- The complete date and the time of the examination.
- The statement of the victim *in his/her own words*.
- The findings of the clinical examination.
- The samples taken and the examinations carried out.

Notes:
- The name of the victim (except for certificates passed on to HCR or to ICRC *without the consent of the victim*, see below), the name of the physician and his/her signature, as well as the date of the examination must appear on each page.
- A copy containing the victim's name is given *to the victim for future legal use*. Keep a copy of the medical certificate (or, if the case should arise, of the mandatory report[a]) in the patient record, archived to allow future authentication of the certificate given to the victim.

What the practitioner should not do:
- Rephrase the words of the victim as the practitioner 's own.
- Endorse the identity of the aggressor nor the nature of the crime, this must be left to the legal authorities.
- Conclude that there was no sexual violence in the absence of lesions on clinical examination.

Examples of medical certificates for adults and children (see following pages).

With the consent of the victim, the physician gives a copy of the certificate containing the victim's name:
- to HCR (to the protection officer only) if the victim is a refugee or displaced, so that protection measures may be put in place for the individual;
- to ICRC if the victim is a victim of war or a prisoner.

Without the consent of the victim, the physician may give a copy of the certificate to HCR or ICRC, but *without revealing the identity of the victim* (concretely, the sections "family name, first name and precise address" should not appear).

[a] In principle, legal reporting of sexual violence against children under 15 years is mandatory. The only exception is if there is a risk that reporting may further harm the situation of the child. Consider each case individually.

Medical certificate for an adult

I, the undersigned, ... (family name, first name), **doctor of medicine, certify that I have examined on** ..... (hour, day, month, year), **at his/her request, Mr, Mrs, Miss** ..... (family name, first name), **born on the** ..... (day, month, year), **living at** .... (precise address).

S)he declares that (s)he has been the victim of sexual assault on ..... (hour, day, month, year) **at** ..... (place) **by** ..... (one/several aggressors, known/unknown, armed/non-armed).).

During the interview, (s)he stated:
" .... "

Mr, Mrs, Miss ..... **presents the following clinical signs:**

– **On general examination:** .....
(describe the behaviour: prostrated, excited, calm, frightened, mute, tearful, etc.)

– **On somatic examination:** ....
(describe precisely all lesions observed on the entire body: signs of abrasion, cuts, scratches, bites, strangulation, swelling, burns etc. Indicate the site, the extent, the number, the character (old or recent), the severity etc.)

– **On genital examination:** ....
(traumatic lesions, genital infection, etc.)

– **On anal examination:** .....
(detectable traumatic lesions etc.)

– **Examinations completed** (particularly samples taken): .....

In conclusion (optional)

☐ This patient presents physical signs and an emotional reaction compatible with the assault of which (s)he claims to have been victim.

☐ The use of constraint and threat during the assault, or the time period between the date of the assault and the date of the medical consultation, can explain the absence of signs of physical violence on this patient.

This document is established with the consent of the patient and may be used for legal purpose.

Signature of physician

Medical certificate for a child

I, the undersigned, ... (family name, first name), **doctor of medicine, certify that I have examined on** ..... (hour, day, month, year), ... (child's family name, first name), **born on the** ..... (day, month, year), **living at** .... (precise address of the parents or residence of the child), **at the request of** ..... (father, mother, legal representative), **who declares that the child was the victim of sexual assault on** ..... (hour, day, month, year) **at** ..... (place).

During the interview, the child told me:
" ...."
(quote as faithfully as possible the words of the child without interpreting them)

During the interview, ... (name of the person accompanying the child) **stated:**
" ...."

This child presents the following clinical signs:

- **On general examination:** .....
  (describe the behaviour: prostrated, excited, calm, frightened, mute, tearful, etc.)
- **On somatic examination:** .....
  .....
  .....
  (describe precisely all lesions observed on the entire body: signs of abrasion, cuts, scratches, bites, strangulation, swelling, burns etc. Indicate the site, the extent, the number, the character (old or recent), the severity etc.)
- **On genital examination:** .....
  .....
  (is the hymen intact or not (if not, did it occur recently or in the past), traumatic lesions, genital infection etc.)
- **On anal examination:** .....
  (detectable traumatic lesions etc.)
- **Examinations completed** (particularly samples taken): .....

In conclusion (optional)

☐ This patient presents physical signs and an emotional reaction compatible with the assault of which (s)he claims to have been victim.

☐ The use of constraint and threat during the assault, or the time period between the date of the assault and the date of the medical consultation, can explain the absence of signs of physical violence on this patient.

This document is established with the consent of ..... (father, mother or legal representative) **and may be used for legal purpose.**

Signature of physician

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